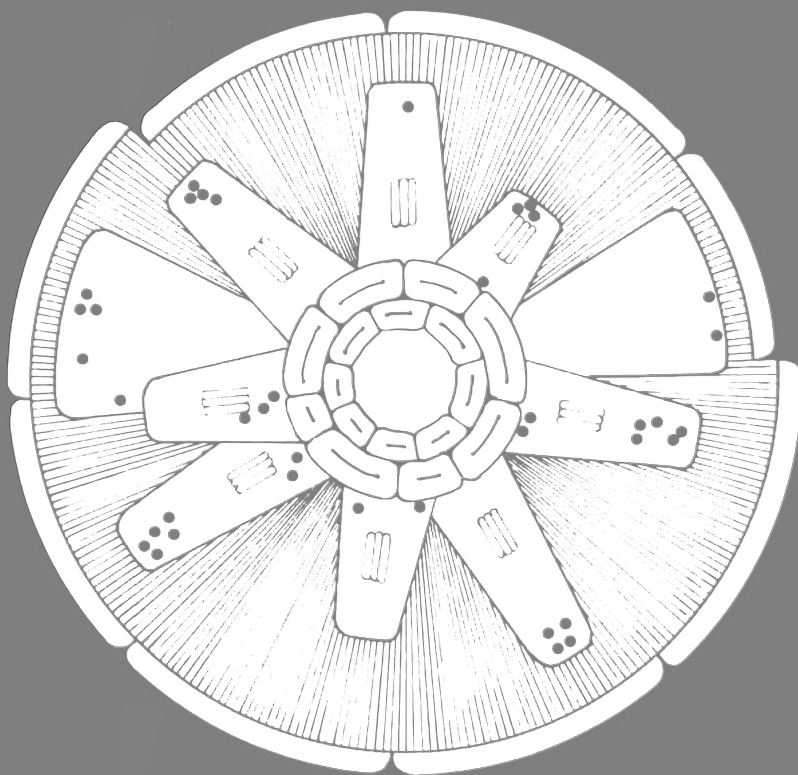


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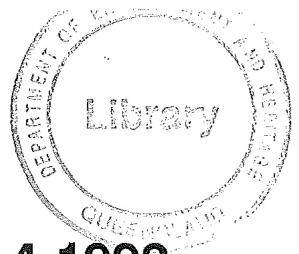
A Journal of Plant Systematics



Queensland Herbarium



Queensland Department of Environment and Heritage



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A TAXONOMIC REVISION OF *CERBERA* L. (APOCYNACEAE) IN AUSTRALIA AND PAPUASIA

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Summary

The genus *Cerbera* L. (Apocynaceae) is revised for Australia and Papuaasia (Irian Jaya, Papua New Guinea and Solomon Islands). Four species are recognised and described with a key for their identification given. *C. manghas* L. and *C. floribunda* Schumann are widespread in the region whereas *C. inflata* S.T. Blake and *C. dunicola* sp. nov. are endemic to Australia. Ethnobotanical use of *C. floribunda* and *C. manghas* in the region is reviewed.

Introduction

The genus *Cerbera* was described by Linnaeus (1753) who recognised three species, namely *C. manghas* L. *C. thevetia* L. and *C. ahouai* L. *C. thevetia* and *C. ahouai* are now considered to be *Cascabela thevetia* (L.) Lippold (syn. *Thevetia peruviana* (Pers.) Schumann) and *Thevetia ahouai* (L.) DC. respectively. *Cerbera manghas* is now widely considered the lectotype of *Cerbera* (Lippold 1980; Boiteau 1981; Smith 1988). Subsequent to Linnaeus, additional species have been added to *Cerbera*, and until recently eight or nine species were considered to belong in the genus (Lippold 1980, Smith 1988). However, Lippold (1980) in her review did not refer to Markgraf (1972) or Fosberg *et al.* (1977) wherein several of these species were referred to *Kopsia* Blume or *Neisosperma* Raf. The genus *Cerbera* up to now therefore comprises *C. manghas*, *C. floribunda* Schumann, *C. odollam* Gaertner, *C. dilatata* Markgraf, *C. inflata* S.T. Blake, and *C. micrantha* (Kanchiru) Pichon.

As defined by Lippold (1980), Boiteau (1981) and Smith (1988), *Cerbera* is most closely allied to genera such as *Cerberiopsis* Vieillard ex Pancher & Sebert from New Caledonia and *Thevetia* L. and *Cascabela* Rafinesque from South America. It differs from *Cerberiopsis* in the indehiscent, fleshy polycarpous fruit lacking albumen (Boiteau 1981), from *Thevetia* most noticeably in the lack of a floral disk, the indehiscent, fleshy polycarpous fruit with a fleshy exocarp, reticulate spongy mesocarp and woody endocarp, and from *Cascabela* in the hypocrateriform corolla, lack of scales in the corolla throat, lack of a floral disk and the woody endocarp (Lippold 1980).

The only previous taxonomic accounts of *Cerbera* in Australia have been by Bentham (1869) and Bailey (1900) who both recognised only a single species from the area, *C. manghas* (incorrectly as *C. odollam* Gaertner). *C. floribunda* Schumann and *C. manghas* L. were both recognised for New Guinea by Markgraf (1926, 1927), and the former for Australia by White (1933). Blake (1948) subsequently described a new species from north-east Queensland, firstly under the illegitimate *C. dilatata* S.T. Blake but later renaming it as *C. inflata* (Blake 1959). Up to the present there has been three described species recognised for the region although in many Australian herbaria there existed considerable undetermined material which has proved to contain collections of an undescribed species from Queensland.

As a precursor to my treatment of the genus in Volume 28 of 'Flora of Australia', the present revision is presented to enable description of the unnamed species from Australia, describe and provide a key for identification of all recognised species, and to typify the names of taxa where required. In addition, I have appended notes on local common names and ethnobotanical use, primarily of *C. floribunda* and *C. manghas* in Papuaasia.

Materials and Methods

This revision is based on herbarium specimens in AD, BO, BRI, BSIP, CANB, CBG, DNA, MEL and QRS (herbarium acronyms as in Holmgren *et al.* 1990), and on plants observed in the field in north Queensland and Solomon Islands. The generic description is largely adapted from Smith (1988) who gave a good overview of the

important features. Species descriptions have been drawn up from dried material or material reconstituted by boiling in detergent and water; however, the descriptions of *C. manghas* and *C. floribunda* are supplemented by observations of fresh and spirit preserved material. With the distribution maps, those for *C. manghas* and *C. floribunda* include supplementary specimen data presented by Markgraf (1927).

Taxonomic Treatment

Cerbera L., Sp. Pl. 208 (1753). **Lectotype:** *C. manghas* L. (*vide* Pichon, Notul. Syst. (Paris) 13: 221 (1948)).

Seem., Fl. Vit. 157 (1866); Pichon, Notul. Syst. (Paris) 13: 221 (1948); Markgraf, Fl. Madagasc. fam. 169: 156 (1976); Lippold, Feddes Repert. 91: 51 (1980); Boitl., Fl. Nouv.-Caléd. et Dépend. 10: 212 (1981); A.C. Smith, Fl. Vit. Nov. 4: 89 (1988).

Perennial shrubs or trees, latex white; foliage glabrous, drying black. Leaves spirally arranged on stems, clustered at stem apices, petiolate; lamina coriaceous, entire or sinuate, secondary lateral nerves spaced, connected by a marginal nerve; lacking colleters at lamina base. Inflorescences terminal, pedunculate, laxly cymose, glabrous, bracteate. Flowers pedicellate. Calyx deeply divided, lobes \pm free, caducous, lacking colleters. Corolla hypocrateriform; tube glabrous externally, internally with or without simple indumentum, swollen about stamens, somewhat constricted above stamens; lobes ovate, obovate, obtuse or emarginate, sinistorse in bud. Stamens inserted in upper part of tube; filaments short (1–2 mm long), slender, glabrous; anthers obliquely ascending, lanceolate, contiguous to style-head with filiform apical appendages; disk lacking. Ovary bicarpellate, each carpel usually with 4 biseriate ovules; style-head composed of 2 annular swellings surmounted by 2 apical, conical, obtuse, thick, appressed stigmatic appendages. Fruits apocarpous; mericarps drupaceous; exocarp fleshy; mesocarp reticulate-spongy with numerous fibers independent of the endocarp; endocarp lignified, smooth or rugose-striate externally, with an apical wing; seeds 1 per locule, compressed, ellipsoid or obloid, not or narrowly winged, hilum large, lacking a coma.

Seven species distributed in Madagascar, Indian Ocean islands, Asia, Malesia, Melanesia and Australia. Four species in Papuasia and Australia.

Key to species of *Cerbera* in Australia and Papuasia

1. Leaf lamina with tertiary venation obscure below; flowers numerous in cyme, generally more than 50 2
 Leaf lamina with tertiary venation reticulate and prominent below; flowers few in cyme, generally less than 30 3
2. Leaf lamina with 13–20 secondary veins below; corolla tube 8–12 mm long 1. *C. floribunda*
 Leaf lamina with 33–37 secondary veins below; corolla 15–18 mm long 2. *C. inflata*
3. Leaf lamina with 25–32 secondary veins below; corolla with red centre, tube 25–35 mm long 3. *C. manghas*
 Leaf lamina with 14–18 secondary veins below; corolla lacking red centre, tube 10–11 mm long 4. *C. dumicola*
1. ***Cerbera floribunda*** Schumann in Schumann & Holtrung, Fl. Kais. Wilh. Land 111 (1899). **Type:** Papua New Guinea. WEST SEPIK PROVINCE: Augusta fluss, *M. Holtrung* 849 (lecto (here designated): K (photo! BRI); isolecto: BO!, L (photo! BRI); Papua New Guinea. 1887, *M. Holtrung* 717 (lectopara: BO!, K (photo! BRI)).

[*Cerbera odollam* auct. non Gaertner: S. Moore, J. Bot. 61, suppl. 32 (1923)].

Schumann, Notizbl. Bot. Gart. Berlin-Dahlem 2: 139 (1898); Boerl., Handl. Fl. Ned. Ind. 2(2): 394 (1899); Schumann & Lauterbach, Fl. Schutzgeb. Sudsee 505

(1901); Markgraf, Nova Guinea 14: 284 (1926); Bot. Jahrb. Syst. 61: 198 (1927); C.T. White, Contr. Arnold Abor. 4: 92 (1933); van Royen *et al.*, Manual Forest Trees Papua & New Guinea, Part 9. Apocynaceae 22–23 (1964); D. Foreman, Checkl. Vasc. Pl. Bougainville. Bot. Bull. No: 5: 102–103 (1971).

Illustrations: van Royen *et al.*, Manual Forest Trees Papua & New Guinea, Part 9. Apocynaceae 23 (1964); Foreman, Checkl. Vasc. Pl. Bougainville. Bot. Bull. No. 5: 103 (1971).

Tree to 30 m high, latex white; foliage and inflorescence glabrous. Bark brown to black grey; sap wood white, heart wood white. Leaf lamina lanceolate-elliptic, 9–24 cm long, 2–5 cm wide, discolorous, margins entire and not sinuate; upper surface dark glossy green, venation obscure; lower surface pale green, secondary veins 13–20 per side of midrib, tertiary venation obscure; tip acute to short acuminate; base cuneate; petiole 30–40 mm long, 1.8–2.0 mm wide. Inflorescence a much branched cyme up to 17 cm long; peduncle 4–6 cm long; flowers numerous with generally over 50 present. Flowers 18–20 mm long, c. 5 mm diameter, sweetly scented; pedicels 2–3 cm long. Sepals lanceolate-ovate, 5.0–6.4 mm long, 3–5 mm wide. Corolla primarily white, but sometimes pinkish-white internally towards tips of lobes and yellowish at bottom of lobes; tube 8–12 mm long, 2.7–3.0 mm diameter, white, constricted above anthers, glabrous internally; lobes lanceolate, 7–10 mm long, 1.8–2.0 mm wide, light green, glabrous. Stamens inserted in upper 3 mm of tube; anthers 1.2–1.3 mm long, c. 0.7 mm wide. Fruit obloid-globose, 9–11 cm long, 5.0–5.5 cm wide, 4.5–4.8 cm thick, pointed at end away from pedicel, blue when ripe. **Fig. 1D.**

Selected specimens: Irian Jaya. Sidei, c. 50 km W of Manokwari, *Iwanggin* BW5753 (CANB ex L); Japen Island, Soemberbaba, Jul 1961, *Koster* BW11159 (BO, BRI ex L); Bernhard Camp, Idenburg River, May 1939, *Brass* 14109 (BO, BRI ex A). Papua New Guinea. MANUS PROVINCE: Rambutoy Island, Peninsula Admin. Centre, 2°18'S, 147°47'E, Mar 1981, *Kerenga & Croft* LAE77382 (BRI). EAST SEPIK PROVINCE: Kankaman, 4°05'S, 144°05'E, May 1969, *Millar* NGF37518 (BRI). NEW BRITAIN PROVINCE: Piriloma Village, 6°06'S, 150°45'E, Mar 1965, *Sayers* NGF29192 (BRI). NEW IRELAND PROVINCE: Inland from Lavongai, c. 26 miles [43.3 km] from Kavieng, 2°46'S, 151°02'E, Jan 1967, *Cooder et al.* NGF29603 (BO, BRI). WESTERN HIGHLANDS PROVINCE: 6 miles [10 km] from Lake Kopiago on Paga Hill road, 5°22'S, 142°33'E, Nov 1968, *Galore & Vandenburg* NGF41029 (CANB). EASTERN HIGHLANDS PROVINCE: Okasa, 10 miles [16 km] SW of Okapa, May 1967, *Womersley* NGF24924 (BRI). MOROBE PROVINCE: Wagau, 6°50'S, 146°50'E, Jan 1965, *Sayers* NGF21566 (BRI, CANB). MADANG PROVINCE: Near Usino Village, Ramu Valley, Jul 1955, *Hoogland* 5016 (BRI, CANB). WESTERN PROVINCE: Dagwa, Oriomo River, Feb–Mar 1934, *Brass* 5991 (BO, BRI ex A). CENTRAL PROVINCE: Kagi Gap area, Kokoda trail, 9°09'S, 147°43'E, Sep 1973, *Croft & Leelan* NGF34727 (BRI). GULF PROVINCE: West bank, junction of Vailala & Lohiki Rivers, Jan 1966, *Schodde* 4311 & *Craven* (BRI, CANB). NORTHERN PROVINCE: Lower W slopes of Topographers, Aug 1954, *Saunders* 44 (BRI, CANB). MILNE BAY PROVINCE: Normanby Island, near Miadaba airstrip, 9°50'S, 150°55'E, Nov 1976, *Croft et al.* LAE68858 (BRI). Solomon Islands. Santa Ysabel, Bogotu Peninsula, near Koloajoa Village, Mar 1964, *Whitmore* BSIP4110 (BSIP). Australia. Queensland. COOK DISTRICT: Daintree, Jul 1943, *Blake* 14992 (BRI, CANB); V.C.L. Noah, Oliver Creek, 16°10'S, 145°25'E, Nov 1978, *Gray* 1095 (QRS); Porn. 62, Alexandra, 16°10'S, 145°25'E, Dec 1972, *Hyland* 6606 (QRS).

Distribution and habitat: Widespread in New Guinea and Solomon Islands, but in Australia it is restricted to a small area near Cairns (**Map 1**). Plants grow along creeks or in marshy areas and are always found near permanent water.

Notes: *C. floribunda* is a distinctive species and the large blue fruits are often a feature of the forest floor where this species may be locally common. In Australia it is only likely to be confused with *C. inflata*, which is restricted to higher altitudes on the Atherton Tableland region. I have selected *Hollrung* 849 as lectotype from the two syntypes, as it is more widely represented in herbaria and has a more precise collection locality than *Hollrung* 717.

Local names and ethnobotanical use: A listing of local names with dialects and region of origin is given in **Table 1**. The wood is used for mouldings and interior finishings in Bougainville (Foreman 1971) and other parts of Papua New Guinea, but is susceptible to blue stain fungal attack (van Royen *et al.* 1964). In Solomon Islands the wood is used for carving and medicine (*Henderson & Santalau* 491 (BSIP)). Medicinal application is for aches and sores with the leaves heated in a fire, after which they are rubbed on the sore area or the person lies down on the warm leaf.

Conservation status: Not rare or endangered. Conserved in Cape Tribulation National Park north of the Daintree River in north Queensland.

Table 1. Local names for *Cerbera floribunda*.

| Name | Dialect & Region | Voucher |
|---------------|------------------------|--------------------------------------|
| Agar | Onijob | Hoogland 4603 (CANB) |
| Aimalua | Kwara'ae; S.I. | Gafui <i>et al.</i> BSIP16430 (BSIP) |
| Aitongatonga | Kwara'ae; S.I. | Whitmore BSIP921 (BSIP) |
| Babai | Biak; Irian Jaya | Koster BW11159 (BRI) |
| Beembin | Wagau*; Morobe | Sayers NGF21566 (CANB) |
| Biegbau | Haltam; Irian Jaya | Moll BW15725 (BO) |
| Brebong | Kemtoek; Irian Jaya | Iwanggin BW9121 (BO) |
| Djokanabaiu | Minufia; Northern | Saunders 44 (BRI) |
| Ekwa | Onjob; Northern | Saunders 44 (BRI) |
| Grey Milkwood | Australian; Cook | Cause <i>et al.</i> (1989) |
| Iona | Akuna; Madang | Smith NGF1088 (BRI) |
| Kiriwi | Pom; Irian Jaya | Schram BW15046 (BO) |
| Milky Pine | Atherton*; Cook | personal obs. |
| Nibwafrim | Amberbaken; Irian Jaya | Koster BW6743 (BO) |
| Oero-Oego | Kapaukoe; Irian Jaya | Vink & Schram BW8713 (BO) |
| Patega | Usino; Madang | Hoogland 5016 (BRI) |
| Pea,paa | Maiama*; Morobe | Ridsdale NGF31684 (BRI) |
| Rubbertree | Australian; Cook | Cause <i>et al.</i> (1989) |
| Sebokko | Manikiang; Irian Jaya | Iwanggin BW5753 (CANB) |
| Sowoek | Mooi; Irian Jaya | Moll BW11727 (BO) |
| Sungwiau | Waskuk; Sepik | Hoogland 10064 & Craven (BRI) |
| Supuk | Bembi; Madang | Hoogland 5016 (BRI) |
| Tarau | Subdidi*; New Britain | Froding NGF26589 (BRI) |
| Tero | Rawa; Madang | Hoogland 5016 (BRI) |
| Totongwala | Kwara'ae; S.I. | Whitmore BSIP4110 (BSIP) |
| Towl | Jal; Madang | Hoogland 5016 (BRI) |
| Vao | Marovo; S.I. | Chapman BSIP428 (BSIP) |

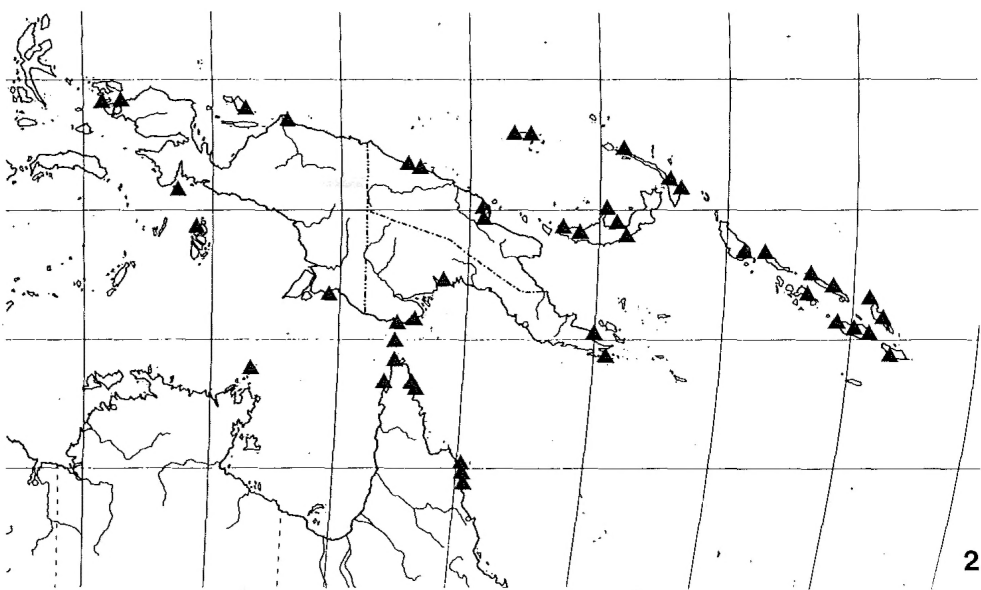
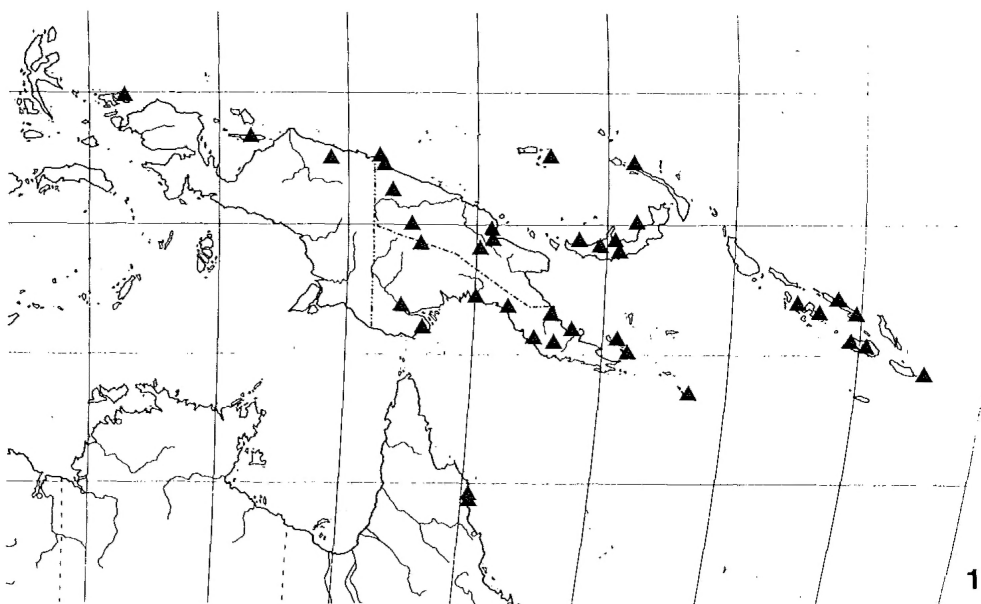
* indicates locality name only, dialect not indicated. Abbreviation: S.I. = Solomon Islands.

2. *Cerbera inflata* S.T. Blake, Proc. Roy. Soc. Queensland 70: 33 (1959). *Cerbera dilatata* S.T. Blake, Proc. Roy. Soc. Queensland 59: 161 (1948), nom. illeg.; non Markgraf (1927). **Type:** Australia, Queensland. COOK DISTRICT: Near Goldsborough, Upper Mulgrave River, 28 July 1943, S.T. Blake 15033 (holo: BRI!; iso: CANB!).

[*Cerbera manghas* auct. non L.: C.T. White, Contr. Arnold Arbor. 4: 92 (1933)].

Tree to 30 m high, latex white; foliage and inflorescence glabrous. Bark grey, pustular with long fissures; sap wood white, heart wood white. Leaf lamina lanceolate-elliptic, discolorous, margins entire and not sinuate; upper surface dull green, venation obscure; lower surface pale green, secondary veins 33–37 per side of midrib, tertiary venation obscure; tip short acuminate; base cuneate; petiole 20–37 mm long, c. 2 mm diameter. Inflorescence a much branched cyme, up to 15 cm long; peduncles up to 5 cm long; flowers numerous, with generally more than 50 present. Flowers 18–27 mm long, 10–13 mm diameter, sweetly scented; pedicels 11–15 mm long. Sepals lanceolate, 4–8 mm long, 1.5–3.0 mm wide. Corolla white to cream-pink; tube 15–18 mm long, 1–2 mm diameter, slightly constricted above anthers, glabrous internally; lobes obovate, c. 6 mm long, 3–4 mm wide, glabrous. Stamens inserted 2.2–2.5 mm from top of tube; anthers 2.5–2.8 mm long, 1.7–1.8 mm wide. Fruit ellipsoid, somewhat pointed at end away from pedicel, 6–7 cm long, 3.0–3.2 cm wide, 2.0–2.5 cm thick, purple when ripe. **Fig. 1A.**

Selected specimens. Australia. Queensland. COOK DISTRICT: Kulara, 15 miles [25 km] WNW of Atherton, May 1921, Hamilton [AQ212353] (BRI); Atherton, Jan 1950, Webb 5118 (CANB); Lake Eacham, 17°17'S, 145°37'E,



Maps 1–2. Distribution in Australia and Papuaia of *Cerbera* spp.: 1. *C. floribunda*. 2. *C. manghas*.

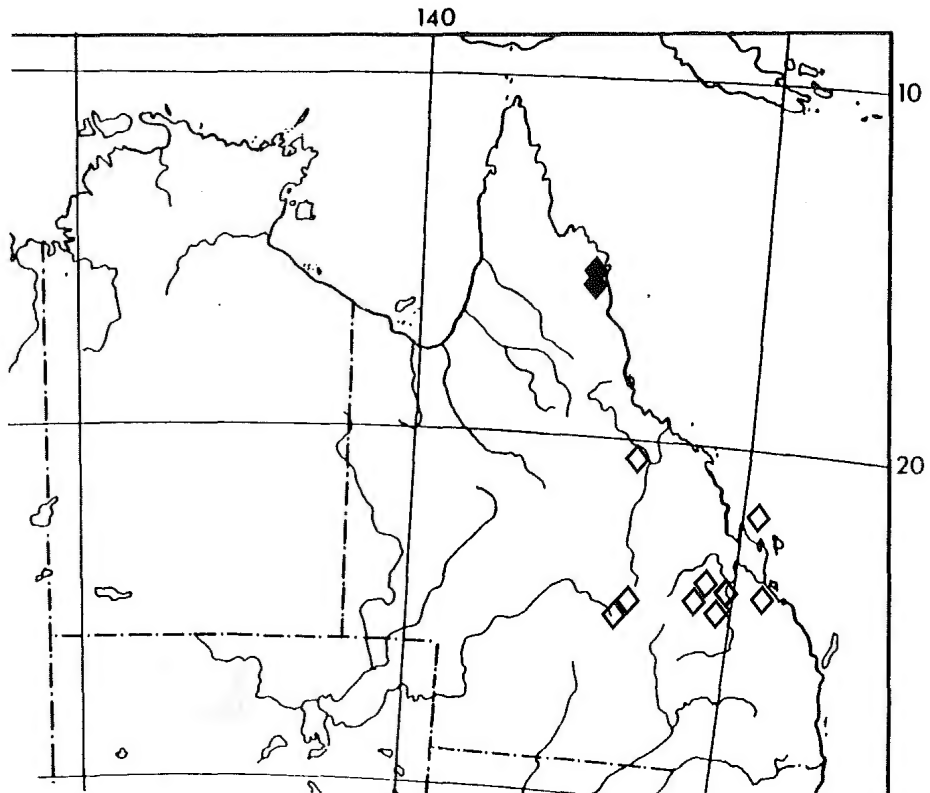
Feb 1956, *Dansie* C36 (CANB); Juara Creek area, Danbulla, Aug 1948, *Smith* 3734 (BRI); Danbulla, near Atherton, Nov 1942, *Blake* 14749 (BRI,DNA); S.F.R. 185, Downfall L.A., 17°10'S, 145°35'E, Jul 1971, *Sanderson* 28 (QRS); S.F.R. 185, Danbulla, 17°10'S, 145°37'E, Apr 1971, *Stocker* 673 (BRI,CANB,QRS); Gadgarra Reserve, Atherton, Jul 1929, *Kajewski* 1141 (BRI); S.F.R. 700, Gadgarra, Gillies L.A., 17°13'S, 145°42'E, Dec 1988, *Hyland* 13786 (QRS); S.F.R. 310, Caribou L.A., Dec 1981, *Hyland* 11414 (QRS); Yungaburra, Jan 1918, *White* [AQ212359] (BRI); near Malanda, Sep 1943, *Blake* 15249 (BRI,CANB); Mt Bartle Frere, north peak, Aug 1943, *Blake* 15244 (BRI); Mt Toressa, 1904, *Bailey* [AQ212354] (BRI); S.F.R. 310, Windin L.A., 17°21'S, 145°45'E, Aug 1979, *Moriarty* 2653 (QRS); S.F.R. 310, Bora L.A., 17°21'S, 145°46'E, Nov 1981, *Gray* 2267 (QRS); S.F.R. 755, Barong L.A., 17°32'S, 145°52'E, 1980, *Gray* 1727 (QRS); Jago, near Innisfail, Sep 1943, *Blake* 15270 (BRI); Babinda, Jul 1943, *Blake* 15024 (BRI,CANB); Deeral, near Babinda, Jul 1943, *Blake* 14970 (BRI).

Distribution and habitat: Restricted to north-east Queensland (Map 3). Plants grow in rainforest, generally away from permanent water.

Notes: As noted by Blake (1948), *C. inflata* is allied to *C. floribunda* but differs in the somewhat narrower leaves with more lateral nerves, the smaller flowers and the smaller ellipsoid fruit.

Local names: "Milky Pine" – *Blake* 14749 (BRI); "Joojooga" – *Bailey* [AQ212354] (BRI); "Grey Milkwood" or "Rubbertree" – *Cause et al.* (1989).

Conservation status: Widespread in north-east Queensland and not considered rare or endangered by the current author, despite the listing in Thomas and McDonald (1989).



Map 3. Distribution of *Cerbera inflata* ◆ and *C. dumicola* ◇.

3. *Cerbera manghas* L., Sp. Pl. 208 (1753); *Tanghinia manghas* (L.) G. Don, Gen. hist. 4: 98 (1838). **Type:** description of Osbeck (Dagbok öfwer en Ostindisk Res., Stockholm 91 (1757)), cited in L., Sp. Pl. 208 (1753); *vide* Fosberg in Boiteau (1981).

J. Forster, Fl. Ins. Austr. Prodr. 19 (1786); Schumann, Notizbl. Bot. Gart. Berlin-Dahlem 1: 55 (1895); Merr. Interpret. Rumph. Herb. Amb. 432 (1917); Markgraf, Nova Guinea 14: 284 (1926); Domin, Biblioth. Bot. 89: 522 (1928); Markgraf, Bot. Jahrb. Syst. 61: 197 (1927); Guillaumin, J. Arnold Arb. 13: 18 (1932); Boit., Fl. Nouv.-Caléd. et Dépend. 10: 214 (1981); Fosb. & Sach. in D.J. Carr, Sydney Parkinson 186 (1983); A.C. Smith, Fl. Vit. Nov. 4: 89 (1988).

Cerbera odollam var. *mugfordii* Bailey, Queensland Agric. J. 3: 282 (1898) (as '*mugfordii*'); *C. manghas* var. *mugfordii* (Bailey) Domin, Biblioth. Bot. 89: 522 (1928). **Type:** [Mourilyan Harbour, *W. Mugford*] [AQ332823] (holo: BRI!).

[*Cerbera odollam* auct. non Gaertner: Benth., Fl. Austral. 4: 306 (1869); Bailey, Queensland fl. 3: 981 (1900)].

Illustrations: Sims, Bot. Mag. 43: t. 1845 (1816); K.A.W. Williams, Native Pl. Queensland 1: 67 (1979), 3: 63 (1987); Fosb. & Sach. in D.J. Carr, Sydney Parkinson pl. 177 (1983); A.C. Smith, Fl. Vit. Nov. 4: 90, fig. 38 (1988).

Small tree to 12 m high; latex white; foliage and inflorescence glabrous. Bark light grey, scaly; sap wood white, heart wood white. Leaf lamina elliptic-obovate, 15–25 cm long, 4–7 cm wide, discolorous, margins entire and not sinuate; upper surface dark glossy green, venation ± obscure; below pale green, secondary veins 25–32 per side of midrib, tertiary venation reticulate and prominent; tip acute, short acuminate or long acuminate; base cuneate; petiole 15–62 mm long, c. 1 mm wide. Inflorescence a little-branched cyme to 20 cm long; peduncles up to 8 cm long; flowers few, with generally less than 30 present. Flowers 30–40 cm long, 20–35 mm diameter, sweetly scented; pedicels 10–20 mm long. Sepals lanceolate to lanceolate-ovate, 12–25 mm long, 4–9 mm wide. Corolla white with red 'eye' at top of tube; tube 22–35 mm long, 2.0–2.5 mm diameter, constricted above anthers near top, with sparse to dense indumentum internally; lobes ovate to obovate, 18–26 mm long, 6–10 mm wide. Stamens inserted c. 2 mm below top of tube; anthers 1.8–2.0 mm long, 1.0–1.2 mm wide. Fruit ovoid-globose, 6–7 cm long, 3.5–4.0 cm wide; 3.5–4.0 cm thick, red when ripe. **Fig. 1B, E–G, J–L.**

Selected specimens. Irian Jaya. Batanta Island, W of Sorong, Marchesa Bay, Amdoei Village, Apr 1954, *van Royen* 3545 (BO,BRI ex L); Adi Island, Feb 1961, *Moll* BW9827 (BRI, CANB). Papua New Guinea. MANUS PROVINCE: Pelikawa, 2°07'S, 146°44'E, Jun 1971, *Stone & Streimann* LAE53788 (BRI). NEW BRITAIN PROVINCE: Torlu River, 6°00'S, 151°02'E, Mar 1965, *Sayers* NGF24208 (BRI). NEW IRELAND PROVINCE: Kavieng, Oct 1964, *Millar* NGF23816 (BRI). BOUGAINVILLE PROVINCE: Karngu, Buin, Oct 1930, *Kajewski* 2239 (BRI ex A). EAST SEPIK PROVINCE: Cape Wom International Park, c. 8 km NW of Wewak town, 3°35'S, 143°35'E, Nov 1976, *Wiakabu & Yefle* LAE70329 (BRI). MOROBE PROVINCE: Markham River mouth, W of Lac, 6°45'S, 147°00'E, Aug 1964, *van Royen* NGF20068 (BRI). MADANG PROVINCE: Tukai, 50 miles [83.3 km] N of Madang, Mar 1968, *Coode & Katik* NGF32749 (BRI). WESTERN PROVINCE: Daru Island, Mar 1936, *Brass* 6272 (BO,BRI ex A). GULF PROVINCE: Keuru, Mar 1926, *Brass* 1191 (BRI). MILNE BAY PROVINCE: Near Tapio Village, Cape Vogel Peninsula, Jul 1954, *Hoogland* 4332 (BRI,CANB). **Solomon Islands.** Guadalcanal, Mbokokimbo River, logging road, c. 2 km SE of main road, 9°28'S, 160°22'E, Jun 1991, *Forster* 8652 & *Liddle* (BISH,BRI,K,L,MEL); Santa Cruz Islands, Tomotu Noi Island, 10°47'S, 166°04'E, Apr 1972, *Powell et al.* BSIP19891 (BSIP,CANB). **Australia.** Northern Territory. Wessel Islands, 11°19'S, 136°36'E, Oct 1972, *Latz* 3500 (BRI,DNA). Queensland. COOK DISTRICT: Mutee Head, Cape York, 10°55'S, 142°15'E, Mar 1990, *Forster* 6430 (BRI,CANB,DNA,K,L,MEL,PERTH,QRS); Kennedy Hill Gorge, 12°28'S, 143°16'E, Jun 1989, *Forster* 5404 & *Kenning* (BRI,L,MEL,QRS); Claudie River (tidal reaches), 12°50'S, 143°20'E, Jul 1972, *Hyland* 6207 (BRI,QRS); Ella Bay, near Innisfail, Jul 1943, *Blake* 15256 (BRI,CANB). WIDE BAY DISTRICT: Freshwater Creek, S of Double Island Point, Aug 1964, *Everist* 7639 (BRI).

Distribution and habitat: Widespread in Malesia and Melanesia. Common in New Guinea and Solomon Islands; in Australia relatively common in north Queensland with one locality in Northern Territory (**Map 2**). Plants at the Freshwater Creek locality in south-east Queensland have been collected numerous times since the 1920s and comprise 2 or 3 trees which must have resulted from a chance establishment long ago. This colony does not seem to have expanded over a period of 70 years and is not considered native to south-east Queensland.

Plants are generally found in the littoral zone behind the mangroves, often in monsoon vine-thicket along the shore or may extend inland in lowland rainforest communities.

Notes: Smith (1988) discussed the typification of this species' name and supported Fosberg's (in Boiteau 1981) lectotypification directly from the Osbeck description based on a Javan specimen, that was cited by Linnaeus.

Boiteau (1981) recognised several varieties and forms under *C. manghas*; however, apart from *C. manghas* f. *manghas*, most of these are probably referable to *C. odollam* Gaertner (Smith 1988).

In a red type folder at BRI is a specimen dating from Bailey's time that is probably the type of *C. odollam* var. *mugfordii*. Despite the lack of label data that agrees with the protologue, there are no other specimens at BRI that could be the Mugford collection and it seems reasonable to assume that this is the type.

Local names and ethnobotanical use: A listing of local names, the dialects of origin, and the relevant vouchers are given in Table 2. In Solomon Islands, the crushed leaves are used on boils or polio with accompanying prayers, and the wood for carving paddles and bowls (Powell BSIP19891 (BSIP), Henderson & Oimae 175 (BSIP)). In Torres Strait, the fruit is used by children as a ball (Lawrie [AQ004029] (BRI)).

Conservation status: Not rare or endangered. Conserved in Cape Wom International Park, East Sepik in Papua New Guinea, but not known with certainty to occur in any Conservation Reserves in Australia.

Table 2. Local names for *Cerbera manghas*.

| Name | Dialect & Region | Voucher |
|---------------|-----------------------|---------------------------------------|
| Aikikira | Kwara'ae; S.I. | Kere BSIP5094 (BSIP) |
| Aimalua | Kwara'ae; S.I. | Boraule <i>et al.</i> BSIP9318 (BSIP) |
| Aitu | Laukana; Morobe | White NGF11155 (BRI) |
| Babai | Biak; Irian Jaya | Moll BW9827 (CANB) |
| Bulo | Tasia*; S.I. | Brass 3284 (BRI) |
| Dalovi | Manukiki; S.I. | Griffith 4/24 (BRI) |
| Gingum | Oomsis*; Morobe | White NGF11170 (BRI) |
| Grey Milkwood | Australian; Cook | Cause <i>et al.</i> (1989) |
| Kaiohto | Gabobora; Milne Bay | Hoogland 4332 (BRI) |
| La Toto | Rapuri; New Britain | Floyd NGF6451 (BRI) |
| Ngambako | Nangu; S.I. | Powell <i>et al.</i> BSIP19891 (BSIP) |
| Papoca | Aniaeri; Irian Jaya | Aet & Idjan 614 (BO) |
| Rubbertree. | Australian; Cook | Cause <i>et al.</i> (1989) |
| Sas | Biak; Irian Jaya | van Royen 3545(BRI) |
| Soto | Manukiki; S.I. | Griffith 4/24 (BRI) |
| To | Santa Ana*; S.I. | Yen BSIP18113 (BSIP) |
| To'o | Are'are; S.I. | de Coppet 146 (BSIP) |
| Toto | Kulumo; New Britain | Barker & Vinas LAE66541 (BRI) |
| Totongwala | Kwara'ae; S.I. | Gafui <i>et al.</i> BSIP17448 (BSIP) |
| Totora | Karngu*; Bougainville | Kajewski 2239 (BRI) |
| Vao | New Georgia; S.I. | Waterhouse 303 (BRI) |
| Wai | Dauan Is; Cook | Lawrie [AQ004029] (BRI) |

* indicates locality name only, dialect not indicated. Abbreviations: S.I. = Solomon Islands.

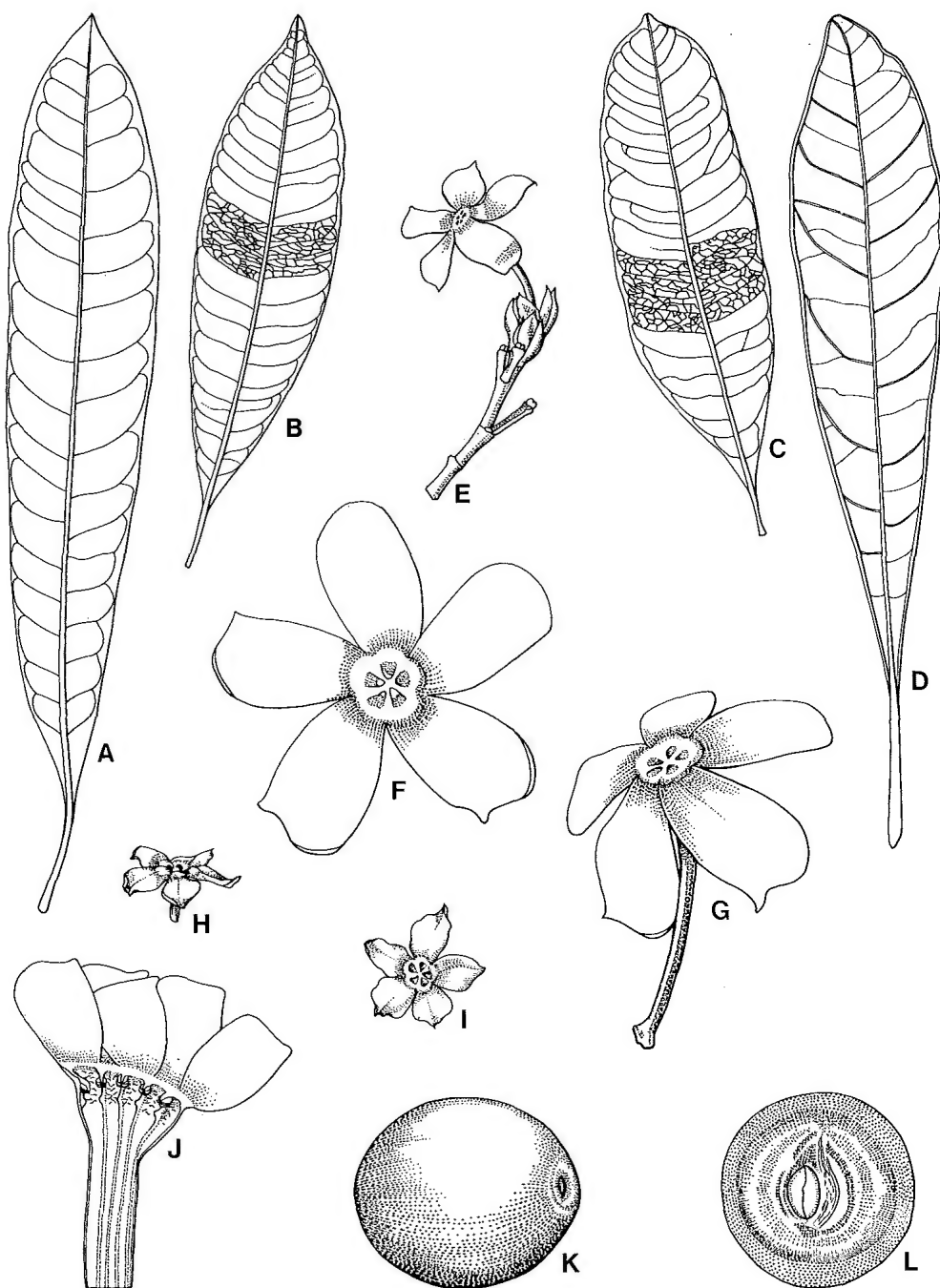


Fig. 1. A–D. lower leaf surfaces showing venation, $\times 5$. A. *Cerbera inflata*. B. *C. manghas*. C. *C. dunicola*. D. *C. floribunda*. E–G. *C. manghas*: E. inflorescence $\times 0.5$. F. face view of flower $\times 1$. G. side view of flower $\times 1$. H–I. *C. dunicola*: H. side view of flower $\times 1$. I. face view of flower $\times 1$. J–L. *C. manghas*: J. longitudinal section of flower showing disposition of anthers in tube $\times 1$. K. intact fruit $\times 0.5$. L. half fruit showing interior $\times 0.5$. A, Smith 3734; B,E–G,J–L, Forster 6430; C,H–I, Batianoff 11705b, D, Blake 14992. Del. W. Smith.

4. *Cerbera dumicola* P. Forster sp. nov. ad *Cerberam manghas* L. affinis, a qua habitu fruticoso, venis lateralibus laminae folii paucioribus (14–18), tubo corollae 10–11 mm longo, et lobis corollae 8–9 mm longis, differt. **Typus:** Queensland. PORT CURTIS DISTRICT: Howard Point, Middle Percy Island, 55 km NE of Arthur Point, Shoalwater Bay, 21°40'S, 150°16'E, 31 October 1989, G.N. Batianoff 11705B, I. Champion, P. Thompson & H.A. Dillewaard (holo: BRI!; iso: MEL!, QRS!).

Shrub or small tree to 4 m high, latex white; foliage and inflorescence glabrous. Bark light grey, fissured longitudinally, somewhat scaly on taller plants; sap wood white, heart wood white. Leaf lamina elliptic-lanceolate to elliptic-oblong, 5–17 cm long, 1.5–6.0 cm wide, discolorous, margins often variously lobed and sinuate; upper surface glossy light green, venation obscure; lower surface pale green, secondary veins 14–18 per side of midrib, tertiary reticulate venation prominent; tip obtuse, acute or short acuminate; base cuneate; petiole 5–12 mm long, 0.7–0.8 mm wide. Inflorescence a little branched cyme up to 8 cm long; peduncle up to 5 cm long; flowers few, with generally less than 30. Flowers 15–18 mm long, 14–20 mm diameter, sweetly scented; pedicels 31–45 mm long. Sepals lanceolate-ovate, 8–9 mm long, 3.5–5.0 mm wide. Corolla white; tube 10–11 mm long, 1.8–2.2 mm diameter, slightly constricted above anthers, with dense indumentum internally; lobes ovate to obovate, 8–9 mm long, 4.5–5.0 mm wide. Stamens inserted c. 2 mm from top of tube; anthers 1.0–1.2 mm long, 0.6–0.7 mm wide. Fruit globose-ovoid, c. 5.5 cm long, 4 cm wide, 4 cm thick, colour unknown. **Fig. 1C, H, I.**

Specimens examined. Australia. Queensland. NORTH KENNEDY DISTRICT: Barrabas Scrub, 20°10'S, 146°45'E, May 1972, Hyland 6097 (QRS). PORT CURTIS DISTRICT: West Bay, Middle Percy Island, 55 km NE of Arthur Point, Shoalwater Bay, 21°40'S, 150°16'E, Nov 1989, Batianoff 11627 *et al.* (BRI). LEICHHARDT DISTRICT: [400–500 miles inland from Rockhampton], 1886, Govt. Surveyor [MEL 1515485] (MEL); range between the Dawson & Mackenzie, [MEL 1515808] (MEL); c. 80 km NE of Emerald, 10 km SSE of "Booroondara", 22°54'S, 148°31'E, Oct 1978, Jones 6 (CBG); Blackwater, Jun 1942, Flowers [AQ212427] (BRI); 5 km NW of Wowan, Banana Shire, 23°50'S, 150°10'E, Feb 1990, Gillespie 4837 (BRI); 23°55'S, 148°48'E, Dec 1985, Thompson [AQ399095] (BRI); Portion 130, Gogango Shire, Parish of Fleetwood, Dec 1983, Heppell [AQ398635] (BRI); Below Blackdown Tableland, Nov 1975, Williams [AQ113486] (BRI); Duaringa, Oct 1943, Blake 15360 (BRI); ditto, Oct 1943, Murray [AQ212426] (BRI); ditto, Nov 1943, White 12460 (BRI); Baralaba, Feb 1943, Maclean [AQ212430] (BRI); 'Coolum', Baralaba on eastern slope of Dawson Range, Nov 1943, Maclean [AQ212429] (BRI); near Stanwell, Apr 1876, O'Shanesy 1829 (MEL). MITCHELL DISTRICT: Romulus Tableland, 57 km SE of Blackall on the top of Enniskillen Range, 24°44'S, 145°52'E, Jul 1975, Beeston 1430c (BRI); Ravensbourne-Mount Edinburgh area, Blackall/Tambo Shire, Jul 1990, Roche [AQ472683] (BRI).

Distribution and habitat: Central coastal and subcoastal Queensland (**Map 3**). Plants occur primarily in lancewood (*Acacia shirleyi* Maiden) thickets away from the coast but may also be found in semi-evergreen vine thickets near the coast.

Notes: *C. dumicola* was discovered in 1876 by R. O'Shanesy who sent material (a sterile leafy stem) to von Mueller in MEL. Although collected sporadically since (collections in MEL), its distinctiveness was only recognised by the late S.T. Blake who made or organised a number of collections of the plant in the 1940s. Despite having fertile material (scrappy flowers only), Blake did not describe the plant and sporadic and nearly always sterile collections were made up until 1990, when good flowering material procured by G. Batianoff and associates allowed for its description. The fruit description is based on a single old sectioned fruit [MEL 1515485] (MEL) and further collections are still required for assessment of variation in the taxon.

C. dumicola is a distinctive species by virtue of the shrubby to small tree habit and the foliage often having sinuate margins. It is most closely allied to *C. manghas* but differs from that species in the shrubby habit, fewer lateral veins in the leaf lamina (14–18 per side of midrib); corolla lacking a red centre, the corolla tube 10–11 mm long and the corolla lobes 8–9 mm long.

Etymology: The specific epithet alludes to the common occurrence of this species in thickets.

Conservation status: Not known to occur in any conservation reserves. The various populations in central Queensland must be considered under threat from agriculture and mining activities. Urgent survey work is required to determine the status of this taxon. A relevant conservation coding is 3RC (cf. Briggs & Leigh 1988).

Acknowledgements

Assistance with field work in north Queensland and Solomon Islands was given by G. Kenning, D. Liddle and M.C. Tucker. G. Batianoff (BRI) collected fertile material of *C. dumicola*. The illustrations were prepared by W. Smith (BRI) with funding from the Australian Biological Resources Study (ABRS). P.R. Sharpe translated various German texts. A.S. George (ABRS) translated the diagnosis into latin. The herbaria AD, BO, BRI, BSIP, CANB, CBG, DNA, K, L, MEL and QRS allowed access to collections either at their institutions or on loan. Loans staff at these institutions and BRI expedited rapid processing. G. Leach (DNA) while Australian Botanical Liaison Officer at Kew, U.K., located and photographed type material. The author was funded for this project by ABRS during 1991–92. This assistance is gratefully acknowledged.

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A NEW SPECIES OF *LIPARIS* RICH. (ORCHIDACEAE) FROM NORTH QUEENSLAND

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Summary

Liparis collinsii B. Gray, a new species of *Liparis* Rich. section *Liparis*, is described and illustrated. In addition notes on its taxonomic affinities, habitat, distribution and conservation status are given.

Taxonomy

Liparis collinsii B. Gray, sp. nov. Differt a *L. simmondsii* Bailey pseudobulbis brevioribus validioribus et foliis angustioribus lanceolatis epetiolatis basi vaginantibus. **Typus:** Cult. Atherton ex Queensland, Timber Reserve 14, Parish of Kesteven, 13°46'S, 143°21'E, 740 m, 13 September 1990, B. Gray 5269 (holo: QRS; iso: BRI, CANB, NSW).

Erect terrestrial herb, deciduous, glabrous, 25–50 cm tall. Pseudobulb fleshy, \pm elliptic in cross section, broadest near the base, tapering to the apex, 6–10 cm long, 2–3 cm diameter; bracts 2–4, ovate, sheathing, strongly ribbed, apex acute; new shoot arising from the base of the old. Leaves (3–4)–6; lamina lanceolate, 10–13 cm long, 4–5 cm wide, somewhat plicate, with 4 or 5 reddish purple ribs below, margin undulate, apex acute. Petiole broad, sheathing, 5–7 cm long. Inflorescence terminal, erect, a 10–20-flowered raceme, 25–35 cm long; peduncle 4-angled, slightly winged, about as long as the rachis; bracts 1 or 2, linear-triangular, 6–9 mm long, 2.0–2.5 mm wide; floral bracts linear, 2–6 mm long, c. 1 mm wide, acute; pedicel with ovary 10–16 mm long. Flowers spreading widely, 2.0–2.5 cm diameter. Dorsal sepal linear to narrowly ovate, 12–14 mm long, 3.0–3.5 mm wide, pale purplish green, margin revolute. Lateral sepals elliptic, somewhat falcate, 9–10 mm long, 3.0–3.5 mm wide, pale purplish cream, revolute. Petals filiform, 11–14 mm long, 1.4–1.5 mm wide, purple, strongly revolute (rolled into a very narrow tube). Labellum obovate, c. 13 mm long, 8–10 mm wide, greenish to greenish cream at the base, suffused with maroon towards the apex, ventral surface with a narrow maroon central line from the base to apex; base cuneate; apex truncate to \pm emarginate; margin denticulate near the apex; semierect in the basal third, and channelled then decurved through 90° and spreading, with 2 calli on the ventral surface; calli c. 2 mm long, 0.5 mm diameter. Column arcuate, c. 7 mm long, 2 mm diameter, greenish cream. Anther cap 1.3–1.4 \times 1.3 mm. Pollinia 4, in 2 pairs.

Distribution and habitat: This species is at present known only from the McIlwraith Range on Cape York Peninsula in Queensland. It grows among granite boulders in relatively open areas in rain forest above 700 m altitude. Plants occur in loose colonies and are leafless throughout the dry season. (June to November or December).

Flowering period: Time of flowering in nature is not known but probably occurs soon after the onset of the wet season. In cultivation flowering occurred from November to January, while the plants were in full growth. Individual flowers last 7–10 days.

Notes: *L. collinsii* is most closely related to *L. simmondsii* Bailey but can be readily distinguished from that by its shorter, stouter pseudobulbs and the narrower, lanceolate non-petiolate leaves which are sheathing at the base. The two species have distinct geographic ranges. *L. simmondsii* has not been recorded north of the Mossman River, which is 350 km south of the McIlwraith Range.

The widespread *L. habenarina* (F. Muell.) Benth. which occurs in open forest and grassland situations of north and eastern Australia differs from *L. collinsii* in having narrower leaves and pseudobulbs which are produced below ground level.

Of the several species in New Guinea, *L. oligantha* Schltr. and *L. finnisterrae* Schltr. appear to be related to *L. collinsii* but are quite distinct.

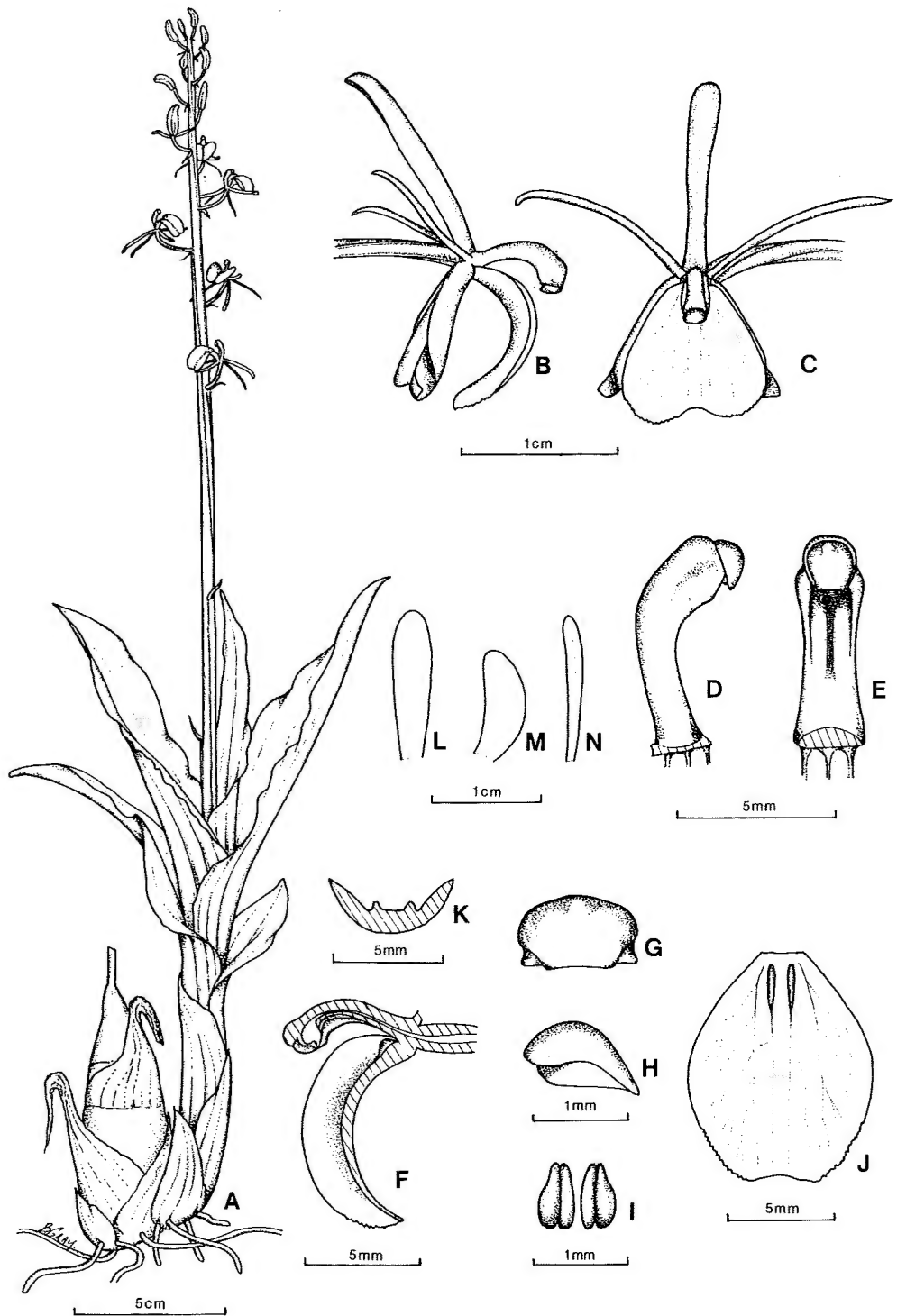


Fig. 1. *Liparis collinsii*: A. habit. B. flower from side. C. flower from front. D. column from side. E. column from front. F. section through column and labellum. G. anther from front. H. anther from side. I. pollinia. J. labellum flattened. K. section through base of labellum. L. dorsal sepal flattened. M. lateral sepal flattened. N. sepal flattened. All from Gray 5269.

Conservation status: This species is poorly known and its distribution, even within the McIlwraith Range area is uncertain.

Etymology: It gives me great pleasure to name this orchid after the late Rev. R.D. (Ron) Collins of Atherton. Ron had a great interest in orchids, was a good friend and accompanied me on many field trips to Cape York Peninsula.

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STUDIES IN AUSTRALIAN GRASSES: 5* NEW SPECIES OF AND NEW COMBINATIONS FOR QUEENSLAND PANICOID GRASSES

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Summary

New species, *Arthrargrostis clarksoniana*, *Cyrtococcum capitis-york*, *Panicum bombycinum*, *Panicum chillagoanum*, *Panicum robustum*, *Paspalum batianoffii*, *Paspalum multinodum* and *Yakirra websteri*, are described. New combinations made are *Brachiaria atrisola*, based on *Urochloa atrisola* and *Brachiaria holosericea* subsp. *velutina*, based on *Urochloa holosericea* subsp. *velutina*. An overview of the current situation regarding the taxonomy of *Brachiaria* and allied genera is given. The occurrence of *Brachiaria distachya* (L.) Stapf in Australia, New Caledonia and Fiji is established.

Introduction

There are a number of new Queensland grasses, first drawn attention to in 'A Key to Australian Grasses' (Simon 1990), that require formal description. Of these, the panicoid species are treated in this paper, with nine new species described and two new combinations made in the genus *Brachiaria* for taxa already described under *Urochloa* by Webster (1987). For each new species there is a Latin diagnosis, a full botanical description, a listing of specimens examined, a section on etymology, a section on conservation status, following the system used by Briggs and Leigh (1988), and some additional notes.

Arthrargrostis Lazarides

A panicoid grass with distinctive tubercle-based hairs on the upper glume and lower lemma was collected from York Downs, near Weipa on Cape York Peninsula, in 1981 by Anne Morton (now Gunness). More recently, two more collections of this grass have been made, one from Meripah in 1987 and the other from Batavia Downs in 1990. In my Australian grass key (Simon 1990) I indicated this species by *Panicum* sp. Morton 191, although the collector's number should have been cited as 1191. The distinctive character of the absolute disarticulation of the panicle at the base of all the branches as well as beneath the spikelets, necessitates the species be placed in the genus *Arthrargrostis* Lazarides.

Arthrargrostis clarksoniana B. Simon, sp. nov. *A. deschampsii* (Domin) Lazarides affinis, sed gluma supera et gluma infero in longitudine aequali plus minusve et pilis tuberculatis differt. **Typus:** Queensland. COOK DISTRICT: 16 km from Meripah homestead on road to the south, 13°49'S 142°22'E, 11 May 1987, J.R. Clarkson 7149 & B.K. Simon (holo: BRI(AQ 452649); iso: MBA, NSW). **Fig. 1.**

Weak annual. Culms erect or basally decumbent, weakly tufted, 40-60 cm tall, sparingly branched at base, 2-4-noded, terminated by a solitary, large and open inflorescence about half the length of the culm. Internodes longer than the associated leaf sheaths which are rounded on the back. Ligule a fringed membrane c. 0.5 mm long. Leaf blades lanceolate, flat, 3-10 cm × 20 mm, pilose, margins smooth with scattered tubercle-based hairs. Inflorescence a panicle with main axis 23-30 cm long and smooth. Primary branches spreading, not whorled, 10-21 cm long, scabrous on the margins. Pedicels 2-12 mm long, distinctly angled, straight, scabrous although with glabrous apices. Callus not differentiated. Spikelets abaxial, 15-25 on a typical lowermost primary branch, dorsiventrally compressed, ovate or elliptic in outline, 3.5-4.0 × c. 1.5 mm. Glumes ± equal, 3.5-4.0 mm long; lower glume, ovate or elliptic in outline, acuminate, 5-7-nerved, membranous, hairy with tubercle-based cilia scattered over the back on the lower two-

*continued from Austrobaileya 3(1): 79-99 (1989)



Fig. 1. *Arthrargrostis clarksoniana*: A. plant $\times 0.5$. B. base of primary branch, showing disarticulation. C. spikelet. D. lower glume, back view. E. upper glume, back view. F. lower floret with minute palea within lemma. G. upper floret, back view. H. upper floret, front view. (B-H $\times 8$). I. caryopsis, view of side with embryo. J. caryopsis, view of side with hilum. (I, J $\times 16$). From type specimen.

thirds; upper glume narrowly elliptic in outline, 7–9-nerved, membranous, hairy with tubercle-based cilia scattered over the back on the lower two-thirds. Rachilla conspicuous between the glumes. Lower lemma elliptic in outline, acute, membranous, glabrous, 3.0–3.5 mm long. Palea of lower floret vestigial, apically truncate. Upper floret perfect, elliptic in outline, shorter than the lower floret. Upper lemma c. 1.5 mm long, yellow, chartaceous, smooth and shiny, rounded on the back, glabrous. Palea of upper floret chartaceous, smooth. Caryopsis c. 1.5 mm long with hilum about half as long as caryopsis.

Specimens examined: Queensland. COOK DISTRICT: York Downs on Myall Creek, 12°45'S, 142°18'E, *Eucalyptus tetrodonta* – *E. confertiflora* grassy open forest, May 1981, Morton 1191 (BRI); Batavia Downs, 12°40'S, 142°40'E, fenced areas around homestead and yards, Apr 1990, Clarkson 8590 & Neldner (BRI, MBA).

Conservation status: 3K (Briggs & Leigh 1988).

Etymology: The species is named for John Clarkson, Queensland Herbarium Senior Botanist at Mareeba. He has enthusiastically collected much interesting botanical material from north Queensland and who has provided me hospitality, facilities and access to remote areas of Cape York on a number of occasions.

Notes: Although the presence of a lower palea for this genus was originally recorded by Domin (1915, under *Panicum deschampsoides*), it has not been mentioned in more recent papers (Lazarides 1984; Simon 1986). However it is present as a very small vestigial membrane in specimens of both *Arthragrostis clarksoniana* and *A. deschampsoides*. The glumes in *A. clarksoniana* differ from those in the other species in being of more or less equal length, although previously reported as having the lower glume longer than the upper (Simon 1990). In some spikelets the lower glume may be slightly longer than the upper glume, but in others the lower glume may be slightly shorter than the upper.

Brachiaria (Trin.) Griseb.

A state of instability exists regarding the taxonomic status of the genera *Urochloa* P. Beauv. and *Brachiaria* (Trin.) Griseb. The classical difference between these genera is whether the spikelet orientation is adaxial (with the lower glume adjacent to the inflorescence axis), the general situation in *Brachiaria* and some panicoid genera, or abaxial (with the lower glume remote from the inflorescence axis) in *Urochloa* and most other panicoid genera. To a lesser extent, the possession of a racemose inflorescence distinguishes *Brachiaria* from other panicoid genera. Both these characters cannot be universally applied, however, and the position regarding the taxonomic value of these characters is summarised in the relevant literature (Chase 1911, 1920; Hughes 1923; Gardner & Hubbard 1938; Blake 1958; Hsu 1965; Parodi 1969; Sendulsky 1978; Zuloaga & Soderstrom 1985; Clayton & Renvoize 1986).

Blake (1958) presented a good summary of the taxonomic history of this group of genera.

“Bentham (1878, 1883) treated under *Panicum* several groups that had been proposed as distinct genera by earlier authors, including all *Brachiaria* and *Urochloa*. Later Chase (1906–11) investigated the diagnostic value of the texture of the upper lemma and the nature of its margins as well as the orientation of the spikelets; she showed that these characters were so correlated with others that some of the groups previously proposed as genera could be sharply redefined as such. Most botanists soon accepted Chase's principles for generic discrimination and new genera were described by Stapf (1917–1930) and others. Some of these genera (*Paspalidium*, *Entolasia*, and *Ottochloa* among others) were not accepted by Chase (1939, 1951 etc.), Hitchcock (1936a, 1936b etc.) or Reeder (1948), all of whom referred the species they dealt with to *Panicum*. These authors and Pilger (1940) treated under *Panicum* (*Panicum* sect. *Fasciculata* Hitch. & Chase or *Panicum* subgen. *Urochloides* Pilger) a group of species referred partly to *Brachiaria* and partly to *Urochloa* by Stapf (1917–1930) and Hughes (1923), and to *Brachiaria* by Gardner and Hubbard (1938).”

In a manuscript of the Paniceae for A. Engler's *Pflanzenreich*, recently distributed from Berlin (B), Mez placed *Brachiaria*, *Urochloa* and *Eriochloa* in *Panicum* subgenus *Brachiaria* (Griseb.) Benth. & Hook.

Brachiaria was originally described as a section of *Panicum* by Trinius (1826) and elevated to generic rank by Grisebach (1853), but neither author indicated the characters by which the taxon could be distinguished. In Trinius's section were four species with reversed (adaxial) spikelets among others with normal (abaxial) spikelets. As Grisebach only mentions *Brachiaria eruciformis* in his treatment, the type of this name is the nomenclatural type of the generic name. He specifically describes the racemose primary branches but not the adaxial spikelets.

Further taxonomic history of the genus is documented by Webster (1987).

"In 1903 Nash, working on the grasses of the southeastern United States, recognised the adaxial orientation of the spikelets and transferred some *Panicum* species to *Brachiaria*. Stapf (1919) in 'Flora of Tropical Africa' used the presence of racemose primary branches as the distinguishing feature of *Brachiaria* and transferred numerous species from *Panicum*. The American authors, Chase and Hitchcock made additional combinations in *Brachiaria*, whereas [Gardner and] Hubbard (1938) and Hughes (1923) named many of the Australian species in *Brachiaria*. These various authors used the racemose primary branches and spikelet orientation to distinguish *Brachiaria* from *Panicum*. Chase (1920) states that *Brachiaria* spikelets are adaxial whereas *Panicum* is abaxial and this character appears in the various keys produced by Hitchcock and Chase."

Blake (1969) transferred four American species of *Panicum* sect. *Fasciculata* to *Brachiaria*; two of these, however, had also been transferred to *Brachiaria* by Parodi (1969) and the combination published only days before Blake's account (Blake 1973). Butzin (1970), in a paper proposing a new subtribal classification of the tribe Paniceae, placed *Brachiaria* in the subtribe Brachiariinae, together with nine other genera, on the basis of the abaxial lower glume, whereas *Urochloa* was placed in the subtribe Paspalinae with 13 other genera on the basis of the adaxial lower glume. Shaw and Siemens (1980) point out the strong affinity between *Brachiaria*, *Eriochloa* and *Urochloa* on the basis of their all possessing the PEP-ck subtype of C_4 photosynthesis (Gutierrez, Gracen & Edwards 1974), and that *Urochloa* differs from the other two by the abaxial orientation of the lower glume and a basic chromosome number of $x = 10$ as opposed to $x = 9$ in *Eriochloa* and *Brachiaria*. However they also add the rider that the latter two characters may not be as significant in the classification of the Paniceae as previously thought.

There appears some dispute whether the lower glume in *Brachiaria* is universally adaxial. Establishing whether the lower glume is adaxial or abaxial in species with long pedicels is difficult, but Gardner and Hubbard (1938) explained a method to overcome this which was summarised by Zuloaga and Soderstrom (1985).

"They suggested that the spikelet just below the terminal one on the axis or on a branch of the panicle be examined to determine the position of the lower glume, because the spikelet is generally short-pedicelled and appressed to the rachis. They commented that the orientation is still occasionally unclear due to suppression or rudimentary development of the lower spikelet of the pair, in which case the terminal spikelet appears to be solitary and in an abaxial position."

Webster (1987), however, implied that this anomaly of spikelet orientation in some of the spikelets of *Brachiaria reptans* is sufficient for the character to lose its significance. It is a reason, considered with other characters, for his placing all Australian species of *Brachiaria*, excluding *B. eruciformis*, in *Urochloa*. However Clayton and Renvoize (1986), while accepting the taxonomic proximity of *Brachiaria*, *Urochloa*, *Eriochloa* and *Panicum*, did not emphasise spikelet reversal in their comparisons but mentioned arbitrary characters such as 'spikelet plumpness' in *Brachiaria* and 'plano-convex shape, cuspidate tip and mucronate upper lemma' in *Urochloa*. However, under *Urochloa*, they stated that "when the spikelets are paired their orientation becomes ambiguous and diagnosis then rests upon their facies. Unfortunately orientation and facies are not wholly correlated, some intermediates being noted under *Brachiaria*, and it is a moot point whether generic rank is justified."

However, the recent transfer of most species of *Brachiaria* and *Panicum maximum* to *Urochloa* by Webster (1987, 1989) and Webster *et al.* (1988, 1989) on the basis of morphological (the possession of rugose rather than smooth fertile lemmas, the spikelet disarticulating at the spikelet base as opposed to above the glumes, and the apex of the upper floret being mucronate to awned rather without mucros or awns) and anatomical (leaf anatomy associated with the PEP-ck biochemical variant of C_4 photosynthesis) characters, is probably premature as Ellis (1988) pointed out "the correlation between PEP-ck type anatomy with centrifugal chloroplasts and panicoid grasses with rugose lemmas is not perfect and that some species with smooth shiny lemmas also belong to this complex." Furthermore the placing of *Eriochloa*, on the basis of its similar leaf anatomy and the lemmas being finely pitted or ridged (Chippindall 1955), in the same group as *Brachiaria*, *Urochloa* and *Panicum maximum* is not followed by Webster. The transfer of most Australian species of *Brachiaria* to *Urochloa* has been accepted by some botanists (Kenneally 1989; Wheeler, Jacobs & Norton 1990; Hnatiuk 1990; Wheeler in press) and the transfer of *Panicum maximum* to *Urochloa* has been accepted by Hnatiuk (1990) and Wheeler (in press) but not by Wheeler, Jacobs and Norton (1990). Watson and Dallwitz (1988), although appearing to agree with the transfer, do not actually accept it. Under *Brachiaria* they made the comment "all but the type species arguably best referred to *Urochloa*," and under *Urochloa* "unsatisfactorily delimited from other close allies of *Panicum*, in particular *Brachiaria*." However, in terms of their 'nearest neighbours' analysis, *Urochloa* is listed as only the fourth closest relative to *Brachiaria* under the treatment of *Brachiaria*, although *Brachiaria* is listed as the closest to *Urochloa* under the treatment of *Urochloa*. Thompson and co-workers (Thompson & Estes 1986; Thompson 1988; Thompson, Tyrl & Estes 1990) have refrained from making generic transfers but indicate that within the *Brachiaria* group of Brown (Gutierrez, Edwards & Brown 1976; Brown 1977), *Brachiaria* (including *Panicum* sect. *Fasciculata*), *Eriochloa* and *Urochloa* appear to constitute a monophyletic group. However they did not mention *Panicum maximum* as a member of the *Brachiaria* group, although included there by Brown and regarded by others as a candidate for generic transfer to the *Brachiaria* group on the basis of its rugose lemmas and PEP-ck anatomy (Ellis 1977; Hattersley 1987; Zuloaga 1987). Until a complete cladistic analysis is undertaken on all member species of the group it is probably better to leave the classification as it is.

Prior to Webster's work a few species of *Brachiaria* had been placed in or transferred to *Urochloa*. Names provided for them in *Urochloa* are *U. reptans* (L.) Stapf (Stapf 1920), *U. gilesii* (Benth.) Hughes and *U. praetervisa* (Domin) Hughes (Hughes 1923), and *U. mutica* (Forssk.) Nguyen, *U. kurzii* (J.D. Hook.) Nguyen and *U. ramosa* (L.) Nguyen (Nguyen 1966). The latter two combinations were superfluously made again by Webster. Thompson (1988) retained in *Brachiaria* the Australian species transferred by Webster to *Urochloa* except *Urochloa gilesii* and *U. reptans*, but I am retaining both of these in *Brachiaria* as the lower glume in both of these species is for the most part adaxial.

I am recognising *Brachiaria* in the classical sense pending results of cladistic work on the whole complex. Names are thus required in *Brachiaria* for taxa described by Webster for the first time in *Urochloa*.

***Brachiaria atrisola* (R. Webster) B. Simon, comb. nov.**

Urochloa atrisola R. Webster, The Australian Paniceae (Poaceae) 232 (1987). **Typus:** Northern Territory. Barkly Tableland, 17°20'S, 135°45'E, undulating *Astrebla* grassland, grey pedocalcic soil, 14 May 1947, S.T. Blake 17776 (holo: BRI(BRI 186629)(AQ 256724); iso: BRI(BRI 065747), CANB, DNA, K, MO). **Fig. 2.**

Additional specimens examined: Northern Territory. BARKLY TABLELANDS: SW of Brunette Downs, dry bed of Lake Sylvester, May 1947 Blake 17830 (BRI, DNA). Queensland. BURKE DISTRICT: 30 miles [48 km] S of Julia Creek, Mitchell grass downs, Mar 1959, Sillar 8 (BRI); Galway Downs, Hughenden, Mar 1933, Kirby s.n. (BRI, K, L, NSW).

Conservation status: Although the species does not appear threatened, I am aware of only four collections of it and therefore it should be placed in the category 3K (Briggs & Leigh 1988).

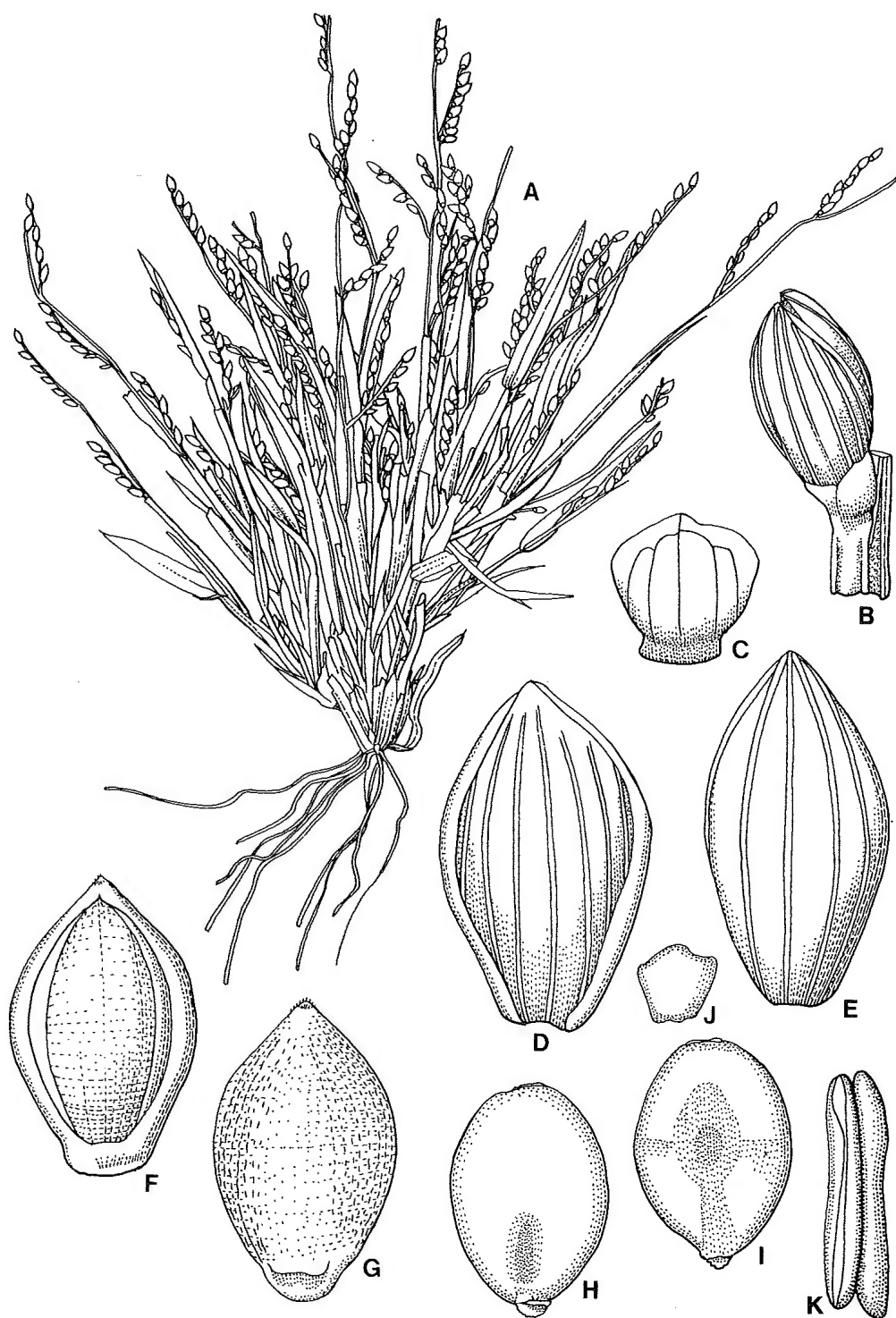


Fig. 2. *Brachiaria atrisola*: A. habit $\times 0.7$. B. spikelet showing adaxial position of lower glume $\times 8$. C. lower glume, back view. D. upper glume, front view. E. lower lemma, back view. F. upper floret, front view. G. upper floret, back view. H. caryopsis, view of side with hilum. I. caryopsis, view of side with embryo. J. lodicule. (C–J, $\times 12$). K. anther $\times 25$. From type specimen.

Etymology: Named for the black soils from which this species has been collected.

Notes: This species is represented only by four collections from the black-soil region of the Barkly Tableland of the Northern Territory and the adjacent parts of Queensland. According to Webster (1987) "it is morphologically similar to the glabrous form of *Urochloa (Brachiaria) piligera* but has a rounded apex on the second glume and lower lemma, turgid spikelets, relatively larger spikelets and lacks the distinct callus at the base of the spikelet."

***Brachiaria holosericea* subsp. *velutina* (R. Webster) B. Simon, comb. nov.**

Urochloa holosericea Webster subsp. *velutina* R. Webster, The Australian Paniceae (Poaceae) 240 (1987). **Typus:** Northern Territory. CENTRAL NORTH DISTRICT: Yeundumu Aboriginal Reserve, 22°10'S, 131°48'E, P.K. Latz 1979 (holo: CANB, n.v., fide Webster loc. cit.)

Specimens examined (All BRI; other herbaria cited where there are duplicates there): Northern Territory. DARWIN AND GULF: Near Balbirini Creek, May 1947, Blake 17740; Katherine, Feb 1947, Miles s.n. CENTRAL NORTH: Mt Doreen Station, Jan 1972, Latz 2046 (DNA). BARKLY TABLELAND: 35 miles [56 km] N of Newcastle Waters, Feb 1969, Must 406 (DNA). Queensland. COOK DISTRICT: 22 km W of Georgetown, Apr 1973, Henderson H1747; The Lynd, Feb 1968, Horsup 6; near Lynd Station, Feb 1954, Lazarides 4163. BURKE DISTRICT: Paroo Range N of Mt Isa, Jan 1990, Harris 434; Chudleigh Park, Feb 1931, Hubbard 7608 & Winders (K); ditto, Hubbard 7674 & Winders (K); Settlement Creek, Mar 1923, Brass 312; Poison Creek N of Hughenden, Apr 1935, Blake 8609; Adel's Grove, Camooweal, Mar 1947, de Lestang 302, 355; 14 miles [22.4 km] N of Mt Sturgeon, Jun 1953, Lazarides 3666 (CANB); 88 miles [141 km] E of Camooweal, Feb 1937, Everist 189 & Smith; Normanton, May 1935, Blake 9044. NORTH KENNEDY DISTRICT: Warrigal Creek, Jun 1980, Rebgetz 422, near Burdekin and Bogie Rivers, Oct 1950, Blake 18690; Heathfield, Aug 1942, Smith T78; Milray, Oct 1935, Blake 9964; Pentland, Apr 1935, Blake 8375; Ayr Beach, Michael s.n. MITCHELL DISTRICT: Prairie, Feb 1931, Hubbard 7034 & Winders (K); Aramac-Torrens Creek Road, Jun 1977, McDonald 2622; Geera, Nov 1935, Blake 10330; E of Jericho, Feb 1931, Hubbard 7834 (K).

Etymology: Named for the velutinous leaves.

Notes: Webster (1987) stated that this subspecies "occurs in the arid and semiarid areas of north central Australia, whereas subspecies *holosericea* occurs north of this area in tropical and subtropical subhumid woodlands. Morphologically, it differs from the typical subspecies in possessing velutinous leaves, fewer and shorter hairs on the inflorescence branches and pedicels, and generally longer awned lower lemmas." Examination of the Queensland Herbarium material revealed that about half the material previously placed unsorted under *Brachiaria holosericea* actually belongs in *B. holosericea* subsp. *velutina*.

***Brachiaria distachya* (L.) Stapf**

For some time confusion has existed concerning the correct application of the names *Brachiaria distachya* (L.) Stapf, *B. miliiformis* (Presl) Chase and *B. subquadriflora* (Trin.) Hitchc. Although these names have been regarded as applying to one species in the Malaya Peninsula (Gilliland 1971), the entity with smaller spikelets and a shorter inflorescence axis with fewer racemes, has been generally recognised as *B. distachya* (Jansen 1953; Bor 1960; Morat 1981; Clayton & Renvoize 1982). Regarding the other two names some authorities (Henrard 1950; Jansen 1953; Morat 1981) have synonymised *B. miliiformis* with *B. subquadriflora* while others (Bor 1960; Blake 1948; Vickery 1961) have recognised both as applying to separate species. The case presented by Jansen (1953) for uniting these species is convincing to me in that a comparison of the drawing of a spikelet of *B. subquadriflora* in Henrard (1950) with that of a spikelet on the type of *Panicum miliiforme* (the basionym of *B. miliiformis*) in Lamson-Scribner (1899) shows them to be almost identical. The drawing of a spikelet on the type of *Panicum subquadriflorum* (the basionym of *B. subquadriflora*) in Trinius (1829) also seems very similar to that of *Panicum miliiforme* in Lamson-Scribner (1899). As described and illustrated the types of both these names are annuals. Both types also show the presence of a lower palea, whereas it appears to be absent in many other specimens of this species examined.

In tropical Australia and Asia there is a decumbent species, referred to in Simon (1990) as *B. sp.* Everist 5112, which has for some time been confused with *B. subquadriflora* due to its very similar, but smaller spikelets. Because of its habit and the possibility that it could have some economic potential as a sward grass, I had been of the opinion it should be formerly recognised. All the specimens of this species have the lower palea

present and I was of the opinion this could be used as a supplementary morphological character to differentiate it from *B. subquadriflora* till my recent discovery of the presence of a lower palea in some specimens of the latter, including the types of both *Panicum miliiforme* and *P. subquadriflorum*. An examination of the microfiche of the type of *Panicum distachyon* in the Linnean herbarium (LINN) and specimens of *Brachiaria distachya* from India matched by C.E. Hubbard with the type (*Gamble* 17629 and *Drummond* 21156, both K with cibachrome photographs in BRI), has brought me to the conclusion that the decumbent sward-forming species referred to above, is in fact this species, although the inflorescence tends to be larger in some of the Australian material than the Indian specimens seen. Whereas the names *Panicum distachyum* (Bentham 1878), or *Brachiaria distachya* (Hughes 1923) have been used in earlier times for an Australian grass species, they have been used for a broad concept of it that includes *Brachiaria subquadriflora*. This is similar to what was done for the taxon on the Malaya Peninsula more recently (Gilliland 1971). C.E. Hubbard was of the opinion in 1933 that "true *B. distachya* does not occur in Australia" in a memorandum on *Brachiaria subquadriflora* sent to the Queensland Herbarium and Webster (1987) did not include *B. distachya* in his treatment of the Australian Paniceae. However there are a fairly large number of specimens in BRI which can be referred to *Brachiaria distachya*. There are a few records of this species from outside Australia in BRI, including some from New Caledonia and Fiji, where it has previously been thought not to occur (Morat 1981; Toutain 1989; Parham 1979) but the specimens cited below belong to this species rather than *B. subquadriflora*, where they were previously placed.

Specimens examined (All BRI; other herbaria cited where there are duplicates there): **Sri Lanka**. Chenkaladi, Dec 1974, *Davidse* 8997 & *Sumithraarachchi* (MO); Paranthan, Dec 1974, *Davidse* 9129 & *Sumithraarachchi* (MO). **New Guinea**. PORT MORESBY PROVINCE: Nebiri Quarry, Apr 1970, *Gebo* UPNG 96. WESTERN PROVINCE: Mabaduan, Jun 1973, *Henty* NGF 49601. BOUGAINVILLE PROVINCE: Kieta, Oct 1969, *Henty* NGF 42711. **Australia**. **Northern Territory**. DARWIN AND GULF: Vanderlin Island, Aug 1988, *Latz* 11063 (CANB,DNA); Adelaide River, Aug 1946, *Blake* 16704. **Queensland**. COOK DISTRICT: Thursday Island, Apr 1931, *Hockings* [AQ 255899]; Cairns, Jun 1930, *Hill* [AQ 255903]; Low Island, Great Barrier Reef, Jun 1969, *Done* [AQ 8175]; Mareeba, Apr 1983, *Clarkson* 4593 (QRS,DNA,PERTH), Jun 1963, *Veurman* [AQ 255900]; Bamaga, May 1981, *Alcorn* 8144, 8145; Yorkeys Knob, Apr 1962, *McKee* 9024; Gordonvale, Oct 1935, *Blake* 9853; Babinda, Mar 1973, *Henderson* H532; Cooktown, Apr 1973, *Henderson* H1602; South Johnstone, Apr 1938, *Langdon* 23; ditto, Jun 1963, *Bailey* 1; Daradgee, Jun 1936, *Goodman* s.n.; Kamarunga, May 1952, *Everist* 5112; Mornington Island, Sep 1981, *Fosberg* 62164; Freshwater, Mar 1938, *Blake* 13349; Bizant, Lakefield National Park, May 1987, *Clarkson* 6953 & *Simon*; Clifton Beach, Feb 1985, *Lear* s.n. [AQ 396685]; Corduroy Creek, Feb 1983, *Steel* 355. **NORTH KENNEDY DISTRICT**: Dingo Beach, Apr 1978, *Simon* 3386; Trebonne, Hinchinbrook, May 1986, *Steel* [AQ 440235]; Clark River Telegraph Station, Jul 1954, *Blake* 19436; Euramo, Mar 1961, *Saint-Smith* s.n.; Townsville, Jun 1975, *Burmeister* s.n.; Little Crystal National Park, May 1975, *Simon* 2621 & *Andrews*; Pettrides Bridge, May 1975, *Simon* 2644 & *Andrews*; Saunders Beach, Apr 1975, *McDonald* 1444 & *Batianoff*. **SOUTH KENNEDY DISTRICT**: Mackay, Apr 1975, *McDonald* 1301 & *Batianoff*. **PORT CURTIS DISTRICT**: Emu Park, May 1975, *Simon* 2559 & *Andrews*. **Vanuatu**. Erromanga, May 1928, *Kajewski* 278; Tanna, Jun 1978, *Morat* 6011, 6022. **New Caledonia**. La Roche percee, Apr 1967, *Schmid* 1995 (NOU); Lifou, May 1969, *Schmid* 2829 (NOU); I.F.O. Anse Vata, Jun 1963, *Blanchon* 179 (NOU). **Fiji**. Naitonitoni, Serua, Aug 1954, *Shradha Nand* 8652.

Cyrtococcum Stapf

Cyrtococcum is a genus of 12 species native to the Old World tropics and its diagnostic features include the lateral compression of the spikelets, a crested apex on the upper lemma and a gibbous second glume and upper lemma. Until now only one species, *C. oxyphyllum* (Steudel) Stapf, has been recorded from Australia and that from the rainforests of north Queensland with a range extending to the tropics of Malesia, Melanesia and Asia. However John Clarkson and John Neldner, Queensland Herbarium Senior Botanists stationed at Mareeba, recently conducted a survey of the Batavia Downs region of Cape York Peninsula and among their collections was a delicate new species of *Cyrtococcum*.

***Cyrtococcum capitis-york* B. Simon, sp. nov.** *C. deccanensi* Bor affinis sed spiculis parvioribus, *C. patenti* (L.) A. Camus affinis, sed spiculis grandioribus et paucioribus differt. **Typus:** Queensland. COOK DISTRICT: 10.8 km S of Batavia Downs on Peninsula Development Road, 21 April 1990, *J.R. Clarkson* 8477 & *V.J. Neldner* (holo: BRI(AQ 463916); iso: B,BRI,DNA,NSW). **Fig. 3.**

Culms stoloniferous, basally decumbent, not tufted, 15–30 cm tall, 7–9-noded, sparingly branched, terminated by a solitary inflorescence. Internodes longer than the associated leaf sheaths. Sheaths slightly compressed and markedly ribbed. Ligule a membrane, c. 0.4 mm long. Leaf blades flat, lanceolate, 2.5–7.0 cm × 3–5 mm, glabrous, sparsely

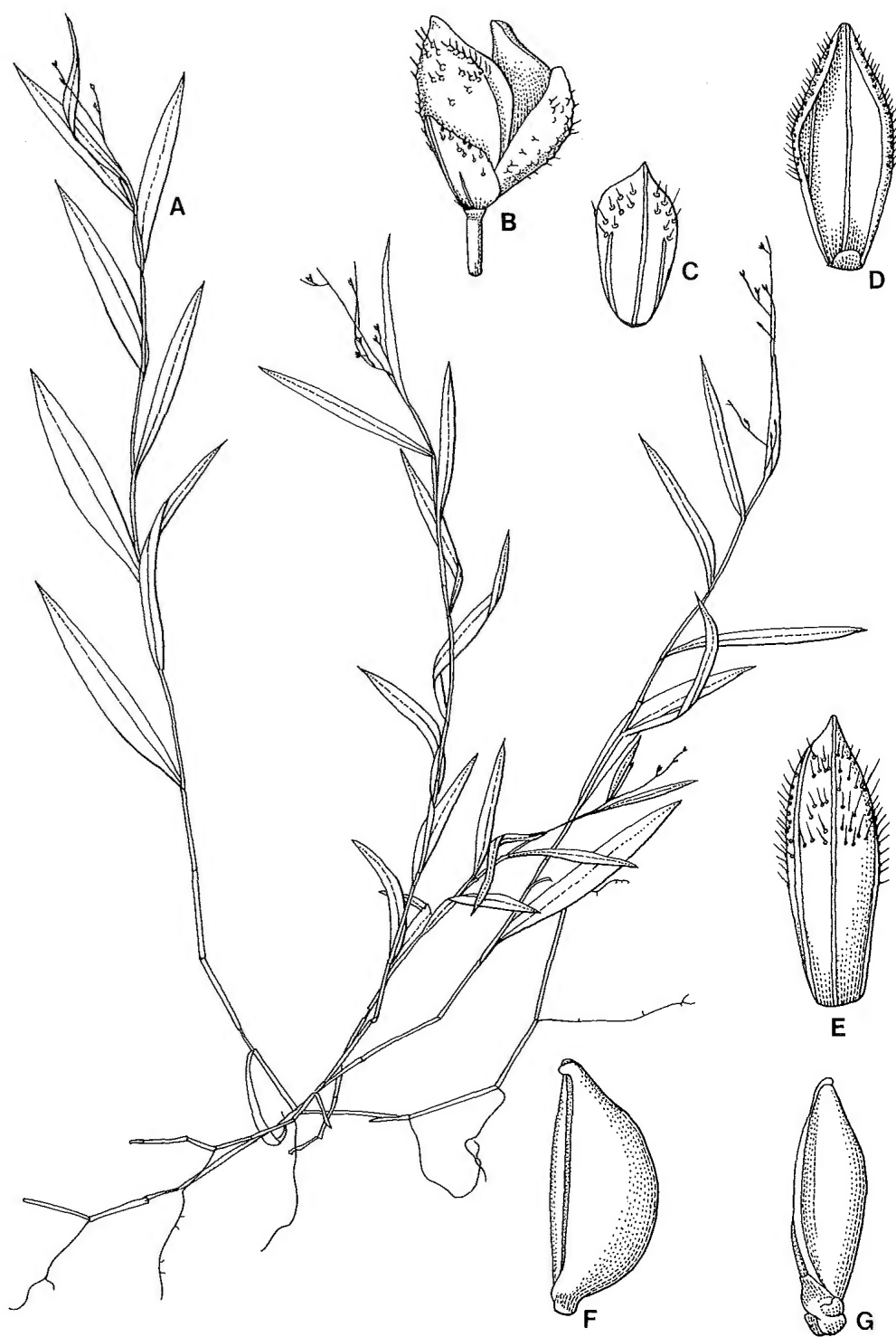


Fig. 3. *Cyrtococcum capitis-york*: A. habit $\times 0.6$. B. spikelet, lateral view $\times 16$. C. lower glume, back view. D. upper glume, front view. E. lower lemma, back view. F. upper lemma, lateral view. G. upper palea, lateral view. (D-G, $\times 25$). From type specimen.

pubescent adaxially, with scabrous margins. Inflorescence a panicle with main axis 2–8 cm long, smooth or rough. Primary branches spreading, not whorled, c. 4 cm long, smooth on the margins. Pedicels 2–5 mm long, distinctly angled, smooth, straight or twisted. Disarticulation at the base of the spikelet. Spikelets abaxial, c. 10 on a typical lowermost primary branch, laterally compressed, obliquely obovate in outline, 1.5–1.7 × 0.8–1.0 mm. Lower glume triangular or ovate, 0.6–0.8 mm long, 3-nerved, membranous, scabrous, setose with hairs tubercle-based. Upper glume obovate, c. 1.5 mm long, 3-nerved, rounded on the back, membranous, hairy with tubercle-based hairs. Rachilla not conspicuous between the glumes. Lower lemma obovate, membranous, hairy, overtopping the spikelet, acute or rounded apically. Palea of lower floret absent. Upper floret perfect, shorter than the lower floret. Upper lemma white, softly cartilaginous smooth, gibbous, navicular, rounded on the back, glabrous, apically rounded. Palea of upper floret softly indurate, smooth. Anthers c. 1 mm long. Caryopsis not seen.

Conservation status: 1K (Briggs & Leigh 1988).

Etymology: Named for Cape York.

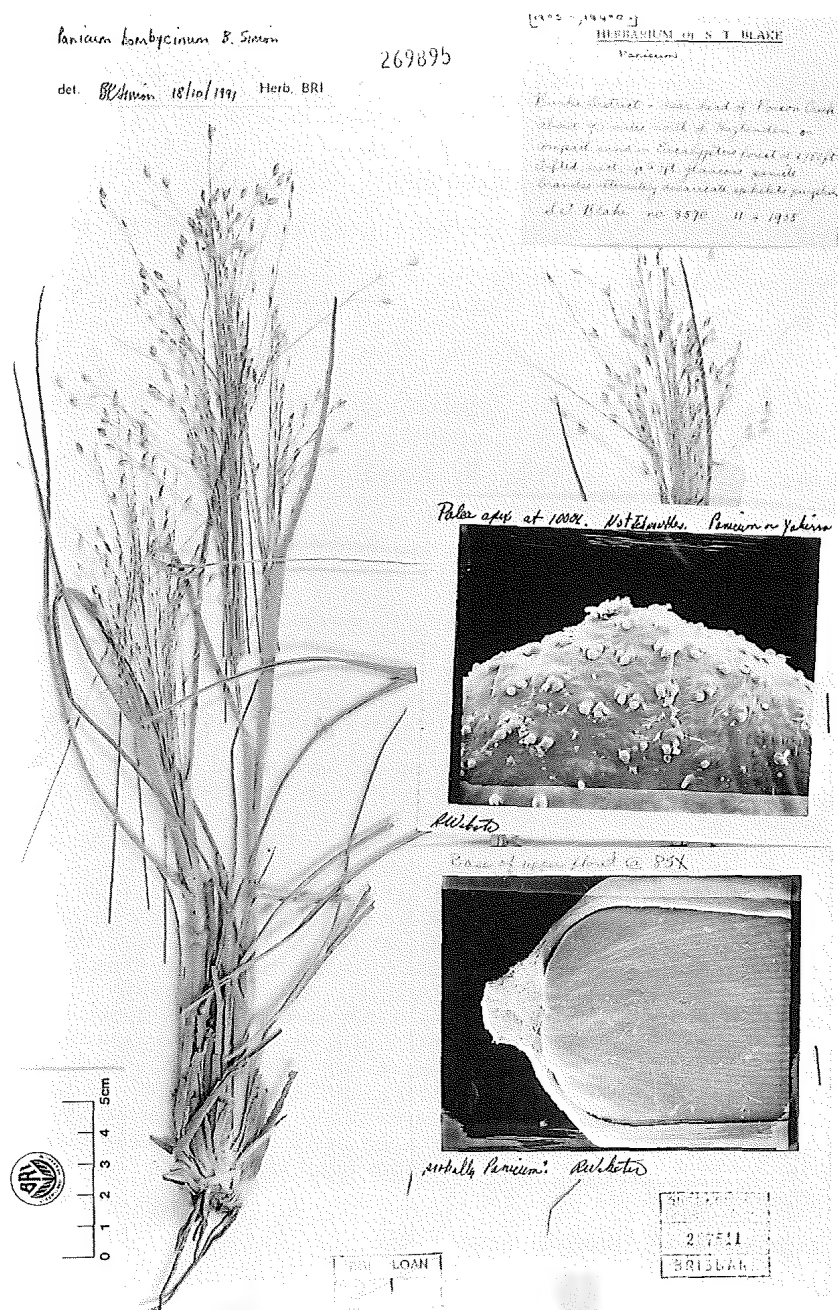
Notes: *Cyrtococcum capitis-york* is very close to *C. deccanense* Bor, itself a distinctive species with local distributions in India and Sri Lanka (Bor 1960), but has slightly smaller spikelets (1.5–1.7 mm long compared to 1.8–2.0 mm long in *C. deccanense*) in which its hairs are tubercle-based. Both these species have a sparse inflorescence of relatively few spikelets compared to that of *C. patens* (L.) A. Camus with a dense inflorescence of many spikelets, a species relatively widespread in southeast Asia with which *C. deccanense* was compared when it was described. These three species all have hairy spikelets.

Panicum L.

Panicum is the largest genus in the grass family with recent estimates figures ranging from ± 470 species (Clayton & Renvoize 1986) to ± 600 species (Zuloaga 1987). As circumscribed last century the genus was even larger, but it was divided into smaller genera on the basis of well-defined morphological characters in the early part of this century by Chase (1906–1911) for the New World species and by Stapf (1917–1930) for the African species. Hughes (1923), working on the Australian species and following the example set by Stapf for Africa, divided Bentham's genus *Panicum* in his *Flora Australiensis* (1878) into 14 genera, leaving 22 species in *Panicum*. However *Panicum* is still a very variable genus and, together with its allied genera, is in need of critical revision at world level to make sense of this variability (Brown 1977). Nevertheless three Australian species of *Panicum*, two of them recognised in Simon (1990) as *Panicum* species and one as a species of *Yakirra*, require formal description.

***Panicum bombycinum* B. Simon, sp. nov.** *P. decomposito* R. Br. affinis, sed glumis inferis multis longioribus et foliis bombycinis, *P. queenslandico* Domin affinis, sed spiculis brevioribus et foliis bombycinis differt. **Typus:** Queensland. SOUTH KENNEDY DISTRICT, 27 km W of Mirtna HS, 21°18'46"S, 145°57'47"E, open savanna woodland, recently burnt, dominated by *Eucalyptus whitei*, with *E. papuana* and *E. brachycarpa* on sandy soil, 6 April 1992, E.J. Thompson BUC 1418 & B.K. Simon (holo: BRI(AQ560012); iso: AD,B,BRI,CANB,DNA,K,L,MEL,MO,NSW,PERTH,US).

Plants perennial. Culms erect, tufted, to 35 cm tall, 2–4-noded, unbranched, terminated by a solitary inflorescence. Internodes shorter than the associated leaf sheaths. Sheaths rounded on the back. Ligule a fringe of hairs c. 1.5 mm long. Leaf blades linear, flat or involute, 9–21 cm × 2–4 mm, hairy, sericeous with scaberrulous margins. Inflorescence a panicle with main axis to 12 cm long, scabrous. Primary branches spreading, to 6 cm long, scabrous on the margins. Pedicels 5–20 mm long, distinctly angled, scabrous, straight. Disarticulation at the base of the primary branches. Spikelets abaxial, 3–5 on a typical lowermost primary branch, dorsiventral compressed, ovate in outline, 3.0–3.5 × 1.0–1.5 mm. Lower glume triangular, acute, 1.7–2.0 mm long, 5- sub 7-nerved, membranous, smooth, glabrous. Upper glume ovate, 3.0–3.5 mm long, 9- sub 11-nerved, rounded on the back, membranous, glabrous. Rachilla not conspicuous between the

Fig. 4. *Panicum bombycinum*.

glumes. Lower lemma ovate, 3.0–3.5 mm long, membranous, glabrous, acuminate. Palea of lower floret vestigial, ovate, acute. Upper floret perfect, shorter than the lower floret. Upper lemma elliptic, 2.0–2.3 mm long, apically rounded, brown, coriaceous, smooth, rounded on the back, glabrous. Palea of upper floret coriaceous, smooth. Anthers c. 1.5 mm long. Caryopsis not seen. **Fig. 4.**

Additional specimens examined. Queensland. BURKE DISTRICT: near head of Poison Creek, about 90 ml [144 km] N of Hughenden, on compact sand in *Eucalyptus* forest, Apr 1945, *Blake* 8540 (**Fig. 4**); SOUTH KENNEDY DISTRICT: 14.5 km SW of Mirtna on shot-line 35 km NW of Mirtna-Yarrumere road, Apr 1992, *Thompson* BUC 146 & *Simon* (BRI,MBA).

Conservation status: 3K (Briggs & Leigh 1988).

Etymology: Named for the silky, velvety hairs covering the leaf sheaths and blades.

Notes: *Panicum bombycinum* is distinctive of the Australian species of *Panicum* in that its leaf sheaths and blades have a dense covering of silky, velvety hairs. It differs also from *P. decompositum* by its longer lower glume (1.7–2.0 mm long compared to 0.5–1.0 mm long in *P. decompositum*) long and differs from *P. queenslandicum* by its shorter spikelets (3.0–3.5 mm long compared to 3.5–5.0 mm long in *P. queenslandicum*). The spikelets thus appear plumper as they have the same width as the spikelets of *P. queenslandicum* (1.0–1.5 mm wide).

Because this species was originally thought to have an appendage at the base of the fertile, upper floret it was placed with *Yakirra* (as *Yakirra* sp. *Blake* 8570) in *Simon* (1990), but closer examination (**Fig. 4**) revealed it to have no such appendage. Furthermore the rachilla between the glumes is not conspicuous as in species of *Yakirra*, so the placement of this species in *Panicum* seems logical on the present evidence.

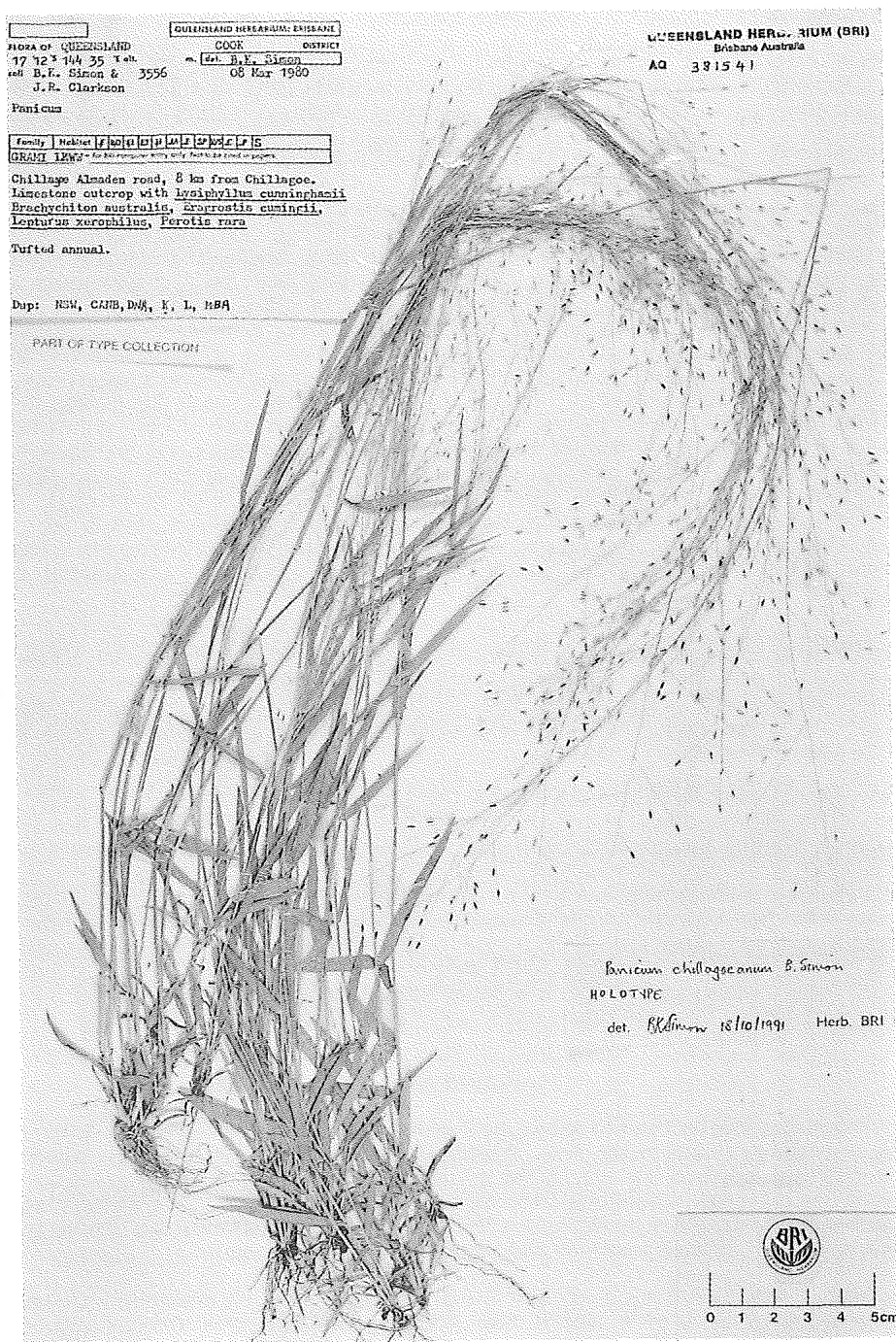
Panicum chillagoanum B. Simon, sp. nov. *P. seminudo* Domin affinis, sed spiculis brevioribus, *P. mitchellii* Benth. affinis, sed habitu annuo, habitans terram calcaream differt. **Typus:** Queensland. COOK DISTRICT: Chillagoe-Almaden road 8 km from Chillagoe, limestone outcrop, 8 March 1980, *B.K. Simon* 3556 & *J.R. Clarkson* (holo: BRI(AQ 381541); iso: BRI,CANB,DNA,K,L,MBA,NSW). **Fig. 5.**

Plants annual. Culms erect, tufted, 15–60 cm tall, 2–3-noded, unbranched, terminated by a solitary inflorescence. Internodes shorter than the associated leaf sheaths. Sheaths slightly compressed. Ligule a fringed membrane c. 1 mm long, with marginal tubercle-based hairs at the sheath blade junction. Leaf blades flat, linear or triangular, 2–12 cm × 2–5 mm, hairy with a few tubercle-based hairs along nerves, especially the midrib, with scaberulous margins. Inflorescence a panicle with main axis 4–25 cm long and smooth. Primary branches spreading, 3–14 cm long, scabrous on the margins. Pedicels 3–12 mm long, distinctly angled, scabrous, straight. Disarticulation at the base of the spikelet. Spikelets abaxial, 15–20 on a typical lowermost primary branch, dorsiventral compressed although laterally compressed at apex, lanceolate in outline, 2.1–2.7 mm × 0.8–1.0 mm. Lower glume triangular, 0.9–1.2 mm long, 5-nerved, acute, membranous, smooth, glabrous. Upper glume ovate, 2.1–2.7 mm long, 5-nerved, apically acuminate, rounded on the back, membranous, glabrous. Lower lemma ovate, slightly shorter than upper glume, membranous, glabrous, apically acuminate. Rachilla conspicuous between the glumes. Palea of lower floret vestigial, apically truncate. Upper floret perfect, shorter than the lower floret. Upper lemma oblong, c. 1.5 mm long, brown, chartaceous, smooth, rounded on the back, glabrous. Palea of upper floret chartaceous, smooth. Anthers c. 1.5 mm long. Caryopsis not observed.

Conservation status: 1K (Briggs & Leigh 1988).

Etymology: Named for the Chillagoe area, where it appears restricted.

Notes: *Panicum chillagoanum* differs from *P. seminudum* Domin by its smaller spikelets (2.1–2.7 mm long compared to 3.1–3.7 mm long in *P. seminudum*) and it differs from *P. mitchellii* Benth. by its annual habit and by its being restricted to limestone habitats of the Chillagoe area as opposed to *P. mitchellii* being perennial and occurring in non-calcareous wet sclerophyll forests and woodlands of north Queensland. This species has been collected only once, from a limestone outcrop in the Chillagoe area where it was

Fig. 5. Holotype of *Panicum chillagoanum*.

locally fairly common. In its endemicity to this region of Queensland resembles other species such as *Atalaya calicicola* Reyn. (Sapindaceae) and *Glossocarya calicicola* Domin (Verbenaceae).

***Panicum robustum* B. Simon, sp. nov.** *P. trachyrhachidi* Benth. affinis, sed spiculis longioribus, glumis inferis longioribus quam glumis superis differt. **Typus:** Queensland. NORTH KENNEDY DISTRICT: Brandy Creek road, 12 km from its source, 13 April 1978, *B.K. Simon* 3370, *J.R. Clarkson* & *N.B. Byrnes* (holo: BRI(AQ 344285); iso: BRI,CANB,DNA,K,L,MO,NSW). **Fig. 6.**

Plants robust annuals. Culms erect or sometimes basally decumbent, weakly tufted, 80–180 cm tall, 3–5-noded, sparingly branched or rarely unbranched. Internodes longer than the associated leaf sheaths. Sheaths rounded on the back. Ligule a fringed membrane c. 2 mm long. Leaf blades flat, linear, 10–35 cm × 5–10 mm, with a distinctive white midrib, hairy, hispid with tubercle-based hairs, and scabrous on margins. Inflorescence a panicle with main axis 25–40 cm long, very lightly scabrous. Primary branches spreading, 10–18 cm long, scabrous on the margins. Pedicels 2–4 mm long, distinctly angled, scabrous, straight. Disarticulation at the base of the spikelet. Spikelets abaxial, dorsiventral compressed, lanceolate in outline, 4.5–5.0 × c. 1 mm. Lower glume lanceolate, 4.5–5.0 mm long, 5–7-nerved, membranous, smooth, glabrous, acuminate. Upper glume lanceolate, 3.5–4.0 mm long, 5–7-nerved, rounded on the back, membranous, glabrous. Lower lemma lanceolate, 3.5–4.0 mm long, membranous, glabrous, apically acute. Rachilla conspicuous between the glumes. Palea of lower floret vestigial, cleft at the apex. Upper floret perfect, shorter than the lower floret. Upper lemma elliptic, c. 2 mm long, pale yellow, chartaceous, smooth, rounded on the back, glabrous, apically rounded. Palea of upper floret chartaceous, uniformly striate. Anthers c. 1.5 mm long. Caryopsis c. 2 mm long.

Specimens examined: Queensland. COOK DISTRICT: Laura River, Peninsular Development road, Apr 1983, *Clarkson* 4719 (BRI,CANB,K,QRS); Mareeba, Mar 1938, *Blake* 13479 (AD,BRI,CANB,DNA,K,L,MO,NSW,PERTH,PRE); Log Creek, 22 km W of Georgetown, Apr 1973, *Henderson* H1734 (BRI); Gilbert River crossing, 84 km WNW of Georgetown, Apr 1973, *Henderson* H1757 (BRI); Welcome Creek plateau, 13 km SSW of Battle Camp, via Cooktown, Jul 1990, *Bean* 1920 (BRI). BURKE DISTRICT: Poison Creek, near Mt. Sturgeon Station, Feb 1931, *Hubbard* 7726 & *Winders* (BRI,K). NORTH KENNEDY DISTRICT: Burdekin River, 30 km NW of Charters Towers, Apr 1978, *Simon* 3453 (BRI).

Conservation status: Not threatened (Briggs & Leigh 1988).

Etymology: Named for the large culm and spikelet dimensions.

Notes: *Panicum robustum* is a robust annual species of rainforest clearings and margins and wet sclerophyll forests and woodlands has been collected a number of times from north Queensland. Like *P. trachyrhachis* it has large spikelets at least 4 mm long, differing in this respect from *P. mindanaense* with its spikelets up to 3 mm long. It is distinguished from *P. trachyrhachis* by its spikelets being more than 4.5 mm long and by its lower glume being longer than the upper one.

Paspalum L.

Paspalum is a tropical to subtropical genus of ± 330 species (Clayton & Renvoize 1986), occurring mainly in the New World where they form an important component of the native grasslands. Of the 18 species recorded for Australia there are four fairly common native species (although the two hydrophytic species *P. distichum* and *P. vaginatum* are considered by Webster (1987) to be introduced) and two native species known from very limited material and which are described here.

***Paspalum batianoffii* B. Simon, sp. nov.** *P. notato* Fluegge affinis, sed stolonibus, spiculis angustioribus, *P. multinodo* B. Simon affinis, sed stolonibus, spiculis longioribus, *P. vaginato* Sw. affinis, sed racemis et spiculis longioribus, rachidibus latoribus, differt. **Typus:** Queensland. PORT CURTIS DISTRICT: Statue Bay Beach, 6.5 km SE of Yeppoon, very narrow foredune with open woodland of *Casuarina*, *Hibiscus* and *Excoecaria* spp. and groundcover of *Panicum maximum*, *Ipomoea pes-caprae* and *Zoysia macrantha*; performing sand binding function just above high water

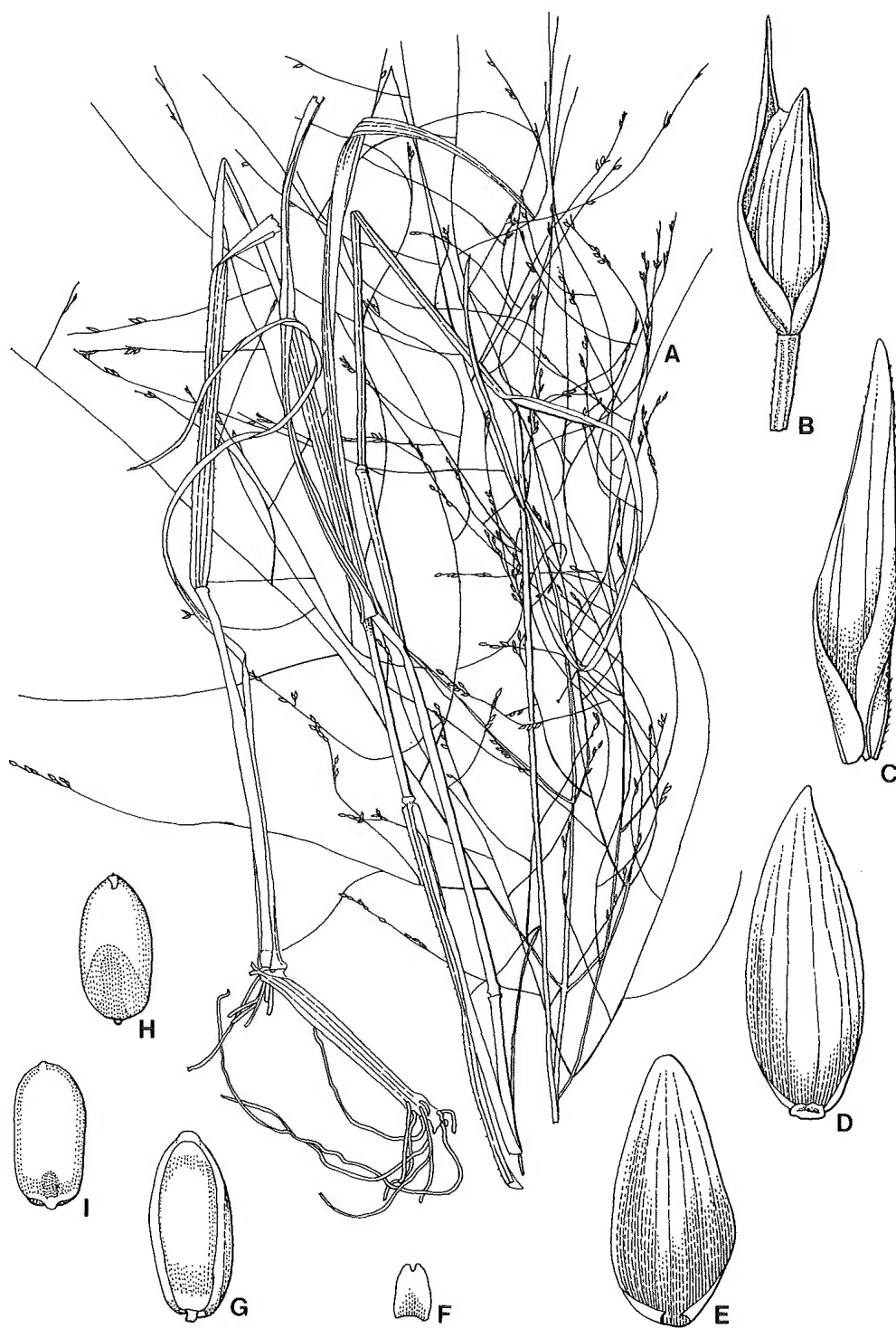


Fig. 6. *Panicum robustum*: A. plant $\times 0.4$. B. spikelet $\times 8$. C. lower glume, front view. D. upper glume, front view. E. lower lemma, front view. F. lower palea $\times 12$. G. upper floret, front view. H. caryopsis, view of side with embryo. I. caryopsis, view of side with hilum. (C-I, $\times 12$). From type specimen.

mark, 8 September 1977, *G.N. Batianoff* 651 & *T.J. McDonald* (holo: BRI(AQ 294456; 3 sheets BRI 294250, BRI 245882 and BRI 245883)). **Fig. 7.**

Plants perennial. Culms stoloniferous, basally decumbent, to 40 cm tall, 2–3-noded, sparingly branched, terminated by a solitary inflorescence. Internodes shorter than the associated leaf sheaths. Sheaths rounded on the back. Ligule a membrane c. 1 mm long, entire. Leaf blades linear, flat or convolute, 8–16 cm × 2–4 mm, glabrous, with smooth margins, with marginal tubercle-based hairs at blade-sheath junction. Inflorescence of 2 or 3 spicate branches, with the main axis 1.5–2.5 cm long and smooth. Primary branches spreading, 6–9 cm long, smooth on the margins, rachis flattened, \pm 2 mm broad. Pedicels extremely short, c. 0.5 mm long, distinctly angled, smooth. Disarticulation at the base of the spikelet. Spikelets dorsiventral compressed, elliptic in outline, c. 4.5 × 1.5 mm. Lower glume absent. Upper glume elliptic, c. 4.5 mm long, 2-nerved, rounded on the back, coriaceous, glabrous. Lower lemma elliptic, coriaceous, the surface glabrous, acute, c. 4.2 mm long. Palea of lower floret absent. Upper floret perfect, slightly shorter than the lower floret. Upper lemma c. 3.5 mm long, yellow, coriaceous, smooth, elliptic, rounded on the back, glabrous, acute. Palea of upper floret coriaceous, smooth. Anthers c. 2 mm long. Caryopsis not observed.

Conservation status: This species is known only from the type and has been known about for a number of years by its inclusion in Thomas and McDonald (1987) as *Paspalum* sp. 'Statue Bay' (*G.N. Batianoff* 651) and in Briggs and Leigh (1988) as *Paspalum* sp. 1 (Statue Bay). In both these publications the designation 1K was assigned to it. Two further attempts to locate and collect the species at the type locality have not been successful so there is a possibility it should be designated 1X.

Etymology: The species is named for George Batianoff, a member of the staff of the Queensland Herbarium, who has shown great enthusiasm in collecting plants from coastal Queensland and associated islands.

Notes: *Paspalum batianoffii* differs from *P. notatum* Fluegge by its stoloniferous culms, longer and narrower spikelets (c. 4.5 × 1.5 mm compared to 2.8–3.7 × 2.0–2.8 mm in *P. notatum*). It differs from *P. multinodum* B. Simon by its stoloniferous culms, fewer nodes (2–3 nodes compared to 10–13 nodes in *P. multinodum*) and longer spikelets (c. 4.5 mm long compared to c. 3.5 mm long in *P. multinodum*). It differs from *P. vaginatum* Sw. by its longer inflorescence branches (6–9 cm long compared to 2–5 cm long in *P. vaginatum*) and its longer spikelets (c. 4.5 mm long compared to 2.5–3.7 mm long in *P. vaginatum*) and by its broader rachis (c. 2 mm broad compared to c. 1 mm broad in *P. vaginatum*).

***Paspalum multinodum* B. Simon, sp. nov.** *P. notatum* Fluegge affinis, sed habitu caespitosis et spiculis angustioribus, *P. batianoffii* B. Simon affinis, sed habitu caespitosis, spiculis brevioribus, *P. vaginatum* Sw. affinis, sed habitu caespitosis, rachidibus latoribus, *P. scrobiculato* L. affinis, sed culmis elatioribus, rachidibus latoribus differt. **Typus:** Queensland. COOK DISTRICT: Aurukun, collector unknown s.n., (holo: BRI(AQ 540191); iso: CANB,K,L). **Fig. 8.**

Plants perennial. Culms erect, tufted, 1.5–2.0 m tall, 10–13-noded, unbranched, terminated by a solitary inflorescence. Internodes longer or shorter (distally) than the associated leaf sheaths. Sheaths keeled and compressed. Ligule a membrane 1.0–1.5 mm long. Leaf blades flat, linear, to 38 cm × 5 mm, glabrous, with smooth margins. Inflorescence spiciform with 2–6 racemes on main axis 0.5–1.0 cm long and smooth. Primary branches spreading, 3–8 cm long, smooth on the margins, rachis flattened, \pm 2 mm broad. Pedicels extremely short, c. 0.5 mm long, smooth, straight. Disarticulation at the base of the spikelet. Spikelets dorsiventral compressed, elliptic in outline, c. 3.5 × 1.5 mm. Lower glume absent. Upper glume elliptic, c. 3.5 mm long, 3-nerved, rounded on the back, membranous, glabrous. Lower lemma elliptic, membranous, glabrous, subacute. Palea of lower floret absent. Upper floret perfect, shorter than the lower floret. Upper lemma elliptic, c. 3 mm long, white or yellow, coriaceous, smooth, rounded on the back, glabrous, apically rounded. Palea of upper floret coriaceous, smooth. Anthers and caryopsis not observed.

Additional specimen examined: Queensland. COOK DISTRICT: Mapoon Plain S of Cullen Point, N of Weipa, 11°5'S, 141°5'E, seasonally cracking clay plain, Sep 1980, *Godwin* A52 (BRI).

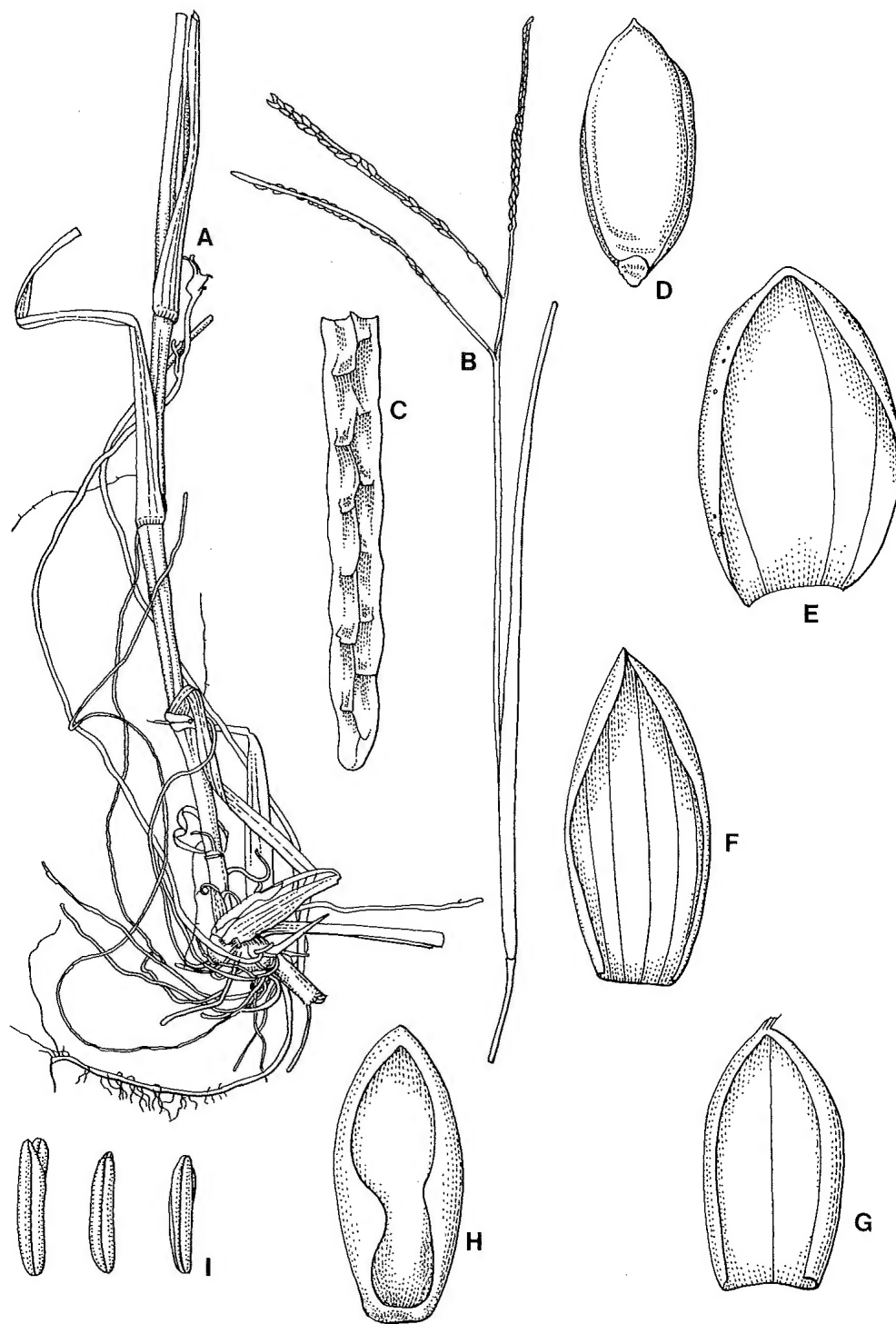


Fig. 7. *Paspalum batianoffii*: A. base of culm $\times 0.7$. B. apex of culm with inflorescence $\times 0.5$. C. portion of rachis of a spike $\times 4$. D. spikelet $\times 8$. E. upper glume, front view. F. lower lemma, front view. G. upper lemma, front view. H. upper palea, front view. I. anthers. (E-I, $\times 12$). From type specimen.

Conservation status: 2K (Briggs & Leigh 1988).

Etymology: The name is derived from the many-noded culms.

Notes: *P. multinodum* is similar to *P. batianoffii* B. Simon in having a broad rachis, but differs from that species by its smaller spikelets (c. 3.5 mm long compared to c. 4.5 mm long in *P. batianoffii*) and its tufted habit. It differs from *P. notatum* Fluegge by its narrower spikelets (c. 1.5 mm wide compared to 2.0–2.8 mm wide in *P. notatum*) and its tufted habit. It differs from *P. vaginatum* Sw. by its broader rachis (c. 2 mm broad compared to c. 1 mm broad in *P. vaginatum*) and tufted habit. It differs from *P. scrobiculatum* L. by its taller culms (1.5 to 2 m tall compared to less than 1.5 m in *P. scrobiculatum*) and its broader rachis (c. 2 mm broad compared to c. 1 mm broad in *P. scrobiculatum*). Only two collections of this species are known. One is from a plant grown from seed collected at Aurukun by a collector not designated and with the name of “Moonpoon Grass”, according to a note attached to the specimen by S.T. Blake. This has been selected as the type, despite the scanty field information associated with it, as it has a number of duplicates that will be distributed to other herbaria. The other is a unicate specimen from the Mapoon Plain south of Cullen, and presumably the source of the name “Moonpoon” in “Moonpoon Grass”.

It was originally thought that *P. batianoffii* and *P. multinodum* may be naturalised New World species but material of them could not be matched from the American collections of *Paspalum* in the Kew herbarium (S.A. Renvoize pers. comm.), nor were fragments and photographs of them recognised by Dr Fernando Zuloaga, a recognised authority of the genera *Paspalum* from the herbarium of the Instituto de Botanica Darwinion, Buenos Aires (SI). It is on the basis of these communications that I decided to name them as new species.

Yakirra Lazarides & R. Webster

Diagnostic features of *Yakirra* include a straight, swollen rachilla between the florets, a conspicuous rachilla between the glumes and a smooth surface on the upper floret. All species except *Y. nulla* Lazarides & R. Webster also have two appendages from the apex of the stipe of the fertile, upper floret. There are two specimens of a new species of *Yakirra* from western Queensland which have these stipe appendages but they are short and hard compared to the appendages in all other species of this genus which have them. Superficially this entity resembles *Panicum effusum* var. *effusum*.

Yakirra websteri B. Simon, **sp. nov.** *Y. muelleri* (Hughes) Lazarides et R. Webster, *Y. majusculae* (F. Muell. ex Benth.) Lazarides et R. Webster, *Y. australiensis* (Domin) Lazarides et R. Webster et *Y. pauciflorae* (R. Br.) Lazarides et R. Webster affinis, sed stipitis flosculi fertili appendicibus brevibus et duris, flosculo superno brunneo vel luteo et habitu perenni differt. **Typus:** Queensland, MITCHELL DISTRICT: 93 km N of Langlo Crossing, 20 May 1975, G.R. Beeston 1361C, (holo: BRI(AQ 268164); iso: BRI(CANB,K,NSW) **Fig. 9.**

Plants perennial. Culms erect, tufted, 25–80 cm tall, 2–3-noded, unbranched, terminated by a solitary inflorescence. Internodes shorter than the associated leaf sheaths. Sheaths rounded on the back. Ligule a fringe of hairs c. 0.5 mm long. Leaf blades linear, flat, 7–12 cm × 2–5 mm, pubescent with tubercle-based hairs; margins scaberulous. Inflorescence a panicle with main axis 12–20 cm long, hairy with tubercle-based hairs. Primary branches spreading, to 10 cm long (longest at base of rachis), scabrous on the margins. Pedicels 2–8 mm long, distinctly angled, scabrous, straight. Disarticulation at the base of the spikelet. Spikelets abaxial, dorsiventral compressed, ovate in outline, 2.5 × 1.5 mm. Lower glume triangular, c. 1.5 mm long, 3- sub 5-nerved, membranous, scabrous on nerves, glabrous, acute. Upper glume ovate, c. 2.5 mm long, 9-nerved, rounded on the back, membranous, glabrous. Rachilla conspicuous between the glumes. Lower lemma ovate, membranous, glabrous, acuminate. Palea of lower floret ovate, acute. Upper floret perfect, shorter than the lower floret. Basal stipe producing two small hard appendages. Upper lemma elliptic, c. 1.8 mm long, brown with white nerves or yellow, chartaceous, rounded on the back, glabrous, apically rounded. Palea of upper floret chartaceous,

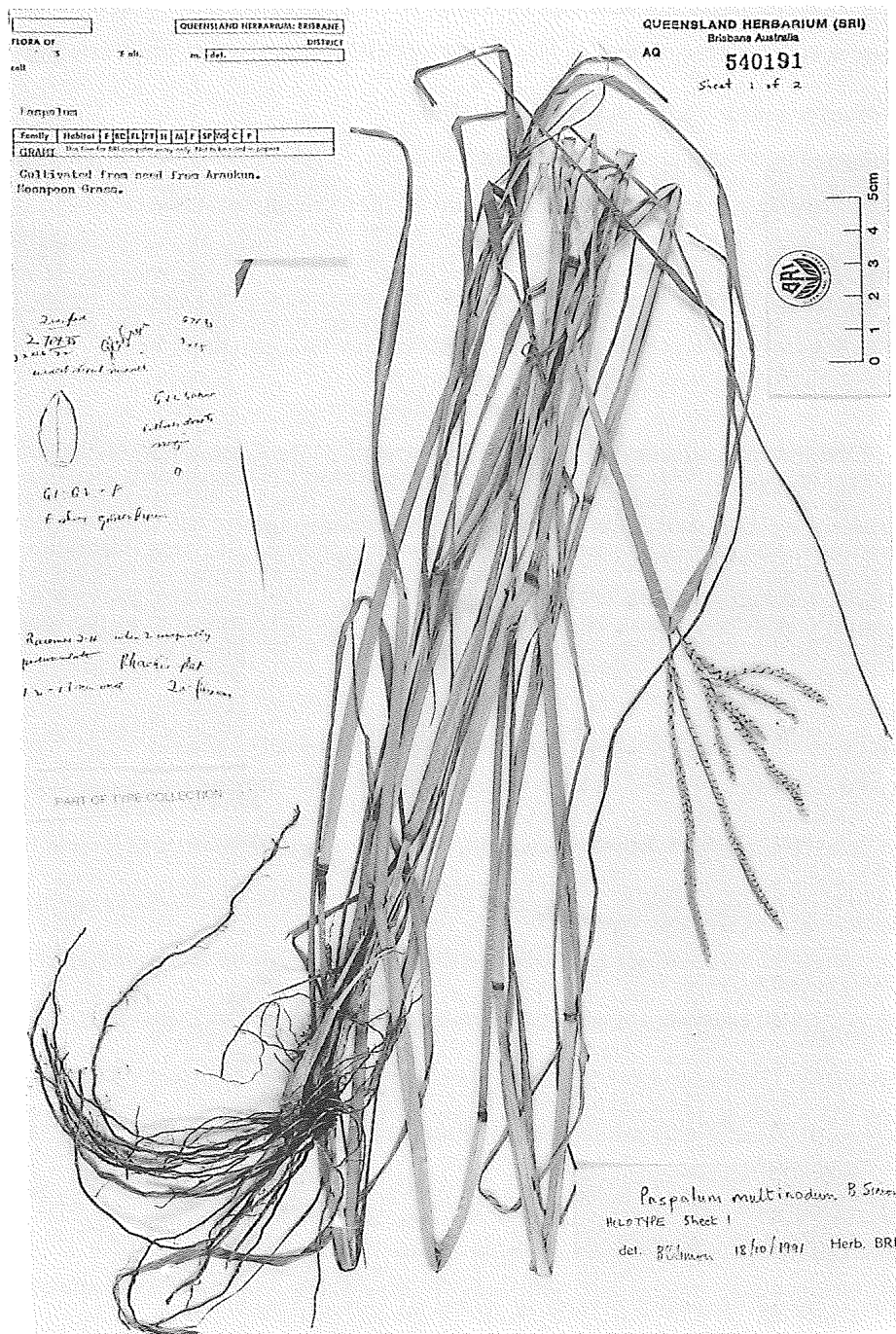


Fig. 8. Holotype of *Paspalum multinodum*, Sheet 1.

uniformly striate. Anthers not observed. Caryopsis c. 1.5 mm long with hilum less than half as long as caryopsis.

Additional specimen examined. Queensland. MARANO DISTRICT: 39 km from Roma on Injune road, May 1975, Simon 2859 & Clarkson (BRI).

Conservation status: 3K (Briggs & Leigh 1988).

Etymology: The species is named for Robert Webster, U.S.D.A. at Beltsville, who studied the Australian taxa of the tribe Paniceae at the Research School of Biological Sciences, A.N.U., using DELTA and is currently editor of the DELTA Newsletter.

Notes: *Yakirra websteri* differs from *Y. muelleri* (Hughes) Lazarides et R. Webster, *Y. majuscula* (F. Muell. ex Benth.) Lazarides et R. Webster, *Y. australiensis* (Domin) Lazarides et R. Webster and *Y. pauciflora* (R. Br.) Lazarides et R. Webster by the stipe of the upper, fertile floret having shorter and hardened appendages by the fertile floret being brown to yellow in colour and by the plant having a perennial habit.

Acknowledgements

I extend my gratitude to colleagues on the staff of the Queensland Herbarium for preparing the figures, Will Smith for the fine illustrations of *Arthrargrostis clarksoniana*, *Brachiaria atrisola*, *Cyrtococcum capitis-york*, *Panicum robustum*, *Paspalum batianoffii* and *Yakirra websteri*, and Hans Dillewaard for the photographs of the types of *Panicum bombycinum*, *Panicum chillagoanum* and *Paspalum multinodum*. I thank Rod Henderson for a critical scrutiny of and improvement to the manuscript. I also thank Greg Leach, Australian Botanical Liaison Officer at Kew, 1990–1991, for providing me with a copy of Nguyen (1966) and Gerrit Davidse, Senior Curator of the herbarium at the Missouri Botanical Garden for working facilities during my visit to St. Louis in 1991.

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Fig. 9. *Yakirra websteri*: A. plant $\times 0.33$. B. spikelet, lateral view $\times 16$. C. lower glume, front view. D. upper glume, front view. E. lower floret, front view, showing lemma enclosing palea. F. upper floret, front view, showing the two basal appendages. G. caryopsis, view of side with embryo. H. caryopsis, view of side with hilum. (C-H, $\times 25$). From type specimen.

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PEROTIS AITON (GRAMINEAE) IN AUSTRALIA AND SOUTHEAST ASIA

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Summary

A survey of the 3 species of *Perotis* Aiton (Gramineae) in Australia and Southeast Asia is given. One species, *P. clarksonii* is described as new, while *P. rara* is recorded from Southeast Asia for the first time.

Introduction

Perotis Aiton (Gramineae) is a small genus of about 10 Old World tropical species. By some (Hubbard in Bor 1960) it has been regarded as belonging to a separate tribe, Perotideae, while others have included it in the Lappagineae (Pilger 1956), Zoysieae (Jacques-Felix 1962), or Cynodonteae-Zoysiinae (Clayton & Renvoize (1986).

Until about 10 years ago only one species, *P. rara* R. Br., was known to occur in Australia. Simon (1981) mentioned the presence of *P. indica* (L.) Kuntze in Queensland, and a third species, new and closely related to *P. rara*, also from Queensland, is described here.

Perotis

Perotis Aiton, Hort. Kew. 1: 85 (1789). **Type:** *Perotis latifolia* Aiton, *nom. superfl.* (based on *Saccharum spicatum* L. = *Perotis indica* (L.) Kuntze).

Xystidium Trin., Fund. Agrost. 102, t. 2 (1820). **Type:** *Xystidium maritimum* Trin. (= *Perotis rara* R. Br.).

Annuals (in Australia). Ligules collar-shaped, membranous. Blades broadest at the rounded to amplexicaul base. Inflorescence a spike-like raceme. Spikelets 1-flowered, solitary, falling entire at maturity, pedicels persistent. Glumes enclosing the floret, dorsally rounded, 1-nerved, long-awned. Rachilla process absent. Lemma membranous, 3-nerved, acute, muticous. Anthers 3. $x = 10$.

Distribution: About 10 species in the Old World tropics, 3 in Australia.

Anatomy: See Clayton and Richardson, Kew Bull. 27: 44 (1973).

Key to the species

1. Racemes laxly spikeled; spikelets at maturity reflexed; lower glume gradually passing into awn, body not distinct from awn; callus up to 1.5 mm long, obconical, slightly flattened, laterally pubescent 2
Racemes densely spikeled; spikelets at maturity patent; lower glume with the body distinct from awn; callus up to 0.3 mm long, terete, stipe-like, puberulous all over. Caryopses terete 2. ***Perotis indica***
2. Leafblades stiffly patent, distichous at short intervals; glumes smooth, glabrous to shortly pubescent; awns at base with c. 1 mm long, spirally twisted hairs along the infolded margins; caryopses flattened, sulcate 1. ***Perotis clarksonii***
Leafblades more or less erect, rather flaccid, not distinctly distichous; glumes more or less scaberulous to setulose; awns rarely setulose at base, bristles then at most 0.5 mm long, straight; caryopses terete 3. ***Perotis rara***

1. *Perotis clarksonii* Veldk., sp. nov.

Planta annua, ad 40 cm alta; foliorum laminae patentes, 1.7–2.5 cm longae, 1.7–2.3 mm latae, planae ad involutae; racemi laxi, 12–27 cm longi, incomplete exserti; spiculae patentes sub anthesi, (35–)47.5–55 mm longae (callo 0.75–1.5 mm longo, obconico leniter complanato, saltem lateraliter pubescenti excluso), glumae gradatim in aristis transientes laeves glabrae ad tote breviter pubescentes, costa scaberula; aristae longe pilosae ad basin pilis lenibus spiraliter tortis ad 1 mm longis argenteis; caryopsides complanatae sulcatae.

Typus: Australia, Queensland. COOK DISTRICT: 0.8 km South of the Laura River crossing on the Peninsula Development road, 15°35'S, 144°27'E, 90 m altitude, 7 March 1987, *Clarkson & McDonald* 6802 (holo: L!; iso: BRI,CANB fragm.!,DNA,NSW!,PERTH,QRS).

Annual, up to 40 cm high. Leaf blades patent, 1.7–2.5 cm × 1.7–2.3 mm, flat to infolded, bristly at base and along the throat of the sheaths. Racemes lax, 12–27 cm long, not completely exerted. Spikelets patent at anthesis, (35–)47.5–55.0 mm long (excluding the 0.75–1.50 mm long, obconical, slightly flattened, at least laterally pubescent callus). Glumes passing gradually into the awns, smooth, glabrous to shortly pubescent all over, midrib scaberulous, awns long-hairy at base, hairs soft, becoming spirally twisted, up to 1 mm long, silvery. Caryopsis flattened, sulcate. **Fig. 1.**

Specimens examined: Australia, Queensland. COOK DISTRICT: 30–40 miles [48–64 km] S of Coen, 14°15'S, 143°10'E, *Symon* 4843 (ADW,AHUC, CANB!, K, L!); Koolburra Station, 15°18'S, 143°58'E, *Clarkson* 3152 (BRI,CANB!, L!); *Clarkson & McDonald* 6802, the type (see above); 15 km W of Battle Camp Road, 29 km NE of Laura, 15°32'S, 144°27'E, *Forster* 4017 (BRI,L fragm.!), Chillagoe-Wrotham Park Road, 16°45'S, 144°5'E, *Simon & Clarkson* 3584 (BRI,CANB!, L!); 3 miles E of Mareeba, *Thorne* 21162 (BRI,L fragm.!).

Distribution and habitat: Far north-eastern Australia; grows in savannah woodland with a grassy understorey, at low altitude.

Collector's notes: Small, tufted grass; nodes red; underside of leaves dark wine red, dark green above; scape and inflorescence pale green.

Note: The awns of the glumes in *P. rara* exceptionally have rather long bristles up to 0.75 mm long, which then also have a tendency to become spirally twisted. An example from the Cook District is *McKee* 9241 (BRI,CANB!) from 5 miles (8 km) S of Dimbulah (c. 17°14'S, 145°6'E), where not only are the awns long-hairy but the glumes and rachis are as well. I (JFV) am not too sure whether this should or should not be regarded as a hairy form of *P. rara* or of *P. clarksonii*. A similar specimen is *Thorne* 21162 (BRI,L fragm.!,RSA) from 3 miles (4.8 km) E of Mareeba (**Fig. 2A & B**). In their leafblades they resemble *P. clarksonii*.

From the Northern Territory I have seen a few specimens with the *P. rara* type of leaf blades, very rough glumes, and awns with such long hairs. I am inclined to retain these in *P. rara*: *Latz* 564, Frew River, 3 miles (5 km) ENE of Epemarra Homestead, c. 20°30'S, 135°30'E (CANB!,NT), a mixture of 'typical' *P. rara*, suggesting that the hairy plant is just a form of that; *Perry* 3258, 9 miles (14.4 km) S of Undoolya Station, 23°41'S, 134°2'E (CANB!); *Winkworth* 815, 15 miles (24 km) SW of Alcoota, 22°50'S, 134°27'E (CANB!).

Etymology: Named after Mr John Richard Clarkson, Mareeba, who collected three out of the six known representatives of this new taxon, in recognition of the many important collections he has made in northern Queensland.

2. *Perotis indica* (L.) Kuntze, Rev. Gen. Pl. 2 787 (1891); *Anthoxanthum indicum* L., Sp. Pl. 1: 28 (1753). Type: *Hermann* s.n. (holo: LINN).

Saccharum spicatum L., Sp. Pl. 1 54 (1753); *Perotis latifolia* Aiton, Hort. Kew. 1: 85 (1789), *nom. superfl.*; *Perotis spicata* (L.) Dur. & Dur., Syll. Fl. congol. 628 (1909); *Perotis latifolia* var. *typica* Domin., Bibl. Bot. 85: 285 (1915), *nom. inval.* **Lectotype:** Hb. Linn. 77.5 (holo: LINN).

Alopecurus bengalensis Houtt., Nat. Hist. 2/13: 206, t. 90, f. 4. (1782) **Type:** not indicated (not found in Hb. Houttuyn in G or L).

Perotis hordeiformis Nees in Hook. & Arn., Bot. Beechey Voy. 248 (1838); Fl. Afr. Austr. 1: 139 (June 1841). **Type:** *Royle* 280 (holo: K; iso: LIV).

Perotis glabrata Steud., Syn. 1: 186 (1854). **Type:** *Cuming* 1399 (holo: P; iso: L).

Perotis birmanica Gand., Bull. Soc. Bot. France 66: 301 (1920). **Type:** *Mokin* 560 (holo: P).

Perotis chinensis Gand., Bull. Soc. Bot. France 66: 301 (1920). **Type:** *Chanet* 14 (syn: P), 137 (syn: P,US) (?isosyn: an unnumbered *Chanet* collection in L).

Perotis perrottetii Gand., Bull. Soc. Bot. France 66: 301 (1920). **Type:** *Perrottet* 1290 ('1390') (holo: P; iso: L).



Fig. 1. *Perotis clarksonii*: A. Habit $\times 0.67$. B. Spikelet $\times 4$. C. Area at base of awns $\times 16$. D. Caryopsis, ventral view $\times 16$. A–D, Clarkson 3152, iso at BRI.

Annuals, up to 75 cm high. Leafblades 1–3 cm × 2–10 mm, base more or less cordate to amplexicaul, usually bristly along the basal margins. Spike 2–20 cm long. Spikelets patent at maturity, 6.5–30.0 mm long (excluding the up to 0.3 mm long, terete, stipe-like, puberulous callus). Glumes scaberulous all over, with midrib scabrous; lower glume 1.5–2.5 mm long, not gradually passing into the up to 16 mm long awn. Caryopsis terete. $2n = 20, 40$.

Distribution and habitat: India to E China (Hopeh), throughout Malesia to Australia (Queensland, Cook District, Walsh River); introduced elsewhere in tropical countries. It grows in sandy soil near the coast, under *Casuarina* sp., in coconut plantations, dry grasslands, usually at low altitudes, rarely as high as 1065 m in Malesia.

Note: In most works *P. indica* and *P. hordeiformis* are regarded as distinct and are distinguished as follows:

| | |
|---|-------------------------------|
| Callus acute, 0.2–0.5 mm long; glumes not conspicuously ciliolate on the keel; lower glume obscurely lobed, evenly and closely hairy all over, with hairs very short, white, appressed to spreading | <i>P. indica</i> |
| Callus truncate, up to 0.2 mm long; glumes conspicuously ciliolate on the keel; lower glume abruptly acute to more or less obtuse, with hairs in close lines, especially at base | <i>P. hordeiformis</i> |

In fact the length and shape of the callus are variable, and the hairs may be both irregular and in rows on the same specimen. Thus both names are taken to refer to only one species here.

3. *Perotis rara* R. Br., Prod. 172 (1810); *Perotis rara* var. *typica* Domin., Bibl. Bot. 85: 285 (1915), *nom. inval.* **Type:** *R. Brown* (holo: BM; iso: NSW).

Xystidium maritimum Trin., Fund. Agrost. 102, t. 2 (1820); Mem. Acad. Sc. St. Petersb. VI, 6: 266 (1915); *Perotis rara* var. *maritima* (Trin.) Domin., Bibl. Bot. 85: 285 (1915). **Type:** *Chamisso* s.n., *Eschscholtz* s.n. (syn: LE).

Xystidium barbatum Presl, Rel. Haenk. 1: 228 (1830). **Type:** *Haenke* s.n. (holo: PR; iso: MO).

Perotis longiflora Nees in Hook. & Arn., Bot. Beechey Voy. 247 (1838); *Perotis latifolia* var. *longiflora* (Nees) Domin., Bibl. Bot. 85: 285 (1915). **Lectotype:** *Vachell* 38 (holo: K; iso: GCE).

Perotis patula Nees in Hook. & Arn., Bot. Beechey Voy. 248 (1838). **Type:** *Meyen* s.n. (holo: K).

Perotis rara var. *euryphylla* Domin., J. Linn. Soc. 41: 274 (1912). **Type:** *Clement* s.n. (holo: K).

Perotis macrantha Honda, Bot. Mag. Tokyo 41: 638 (1927). **Type:** *Yamazaki* s.n. A° 1923 (holo: TI).

Annuals, up to 40 cm high. Blades 1–5 cm × 1–4 mm, rounded at base, bristly along the margins at base and in the throat. Spike 8–30 cm long. Spikelets reflexed at maturity, (7–)13–35 mm long (excluding the up to 1.5 mm long, obconical, slightly flattened, laterally pubescent callus). Glumes scaberulous all over, with midrib scabrous, gradually passing into the awns. Caryopsis terete. $x = ?$. **Fig. 2C–F.**

Distribution and habitat: Asia (Vietnam, Taiwan, SE China) to Australia (excluding Victoria, Tasmania). Grows on beach; eucalypt savanna; sandy river banks; locally common, 0–275 m altitude.

Uses: Decorative in flower; cattle are said not to like it but it might supply some slight grazing for sheep (Vickery, Fl. N.S.W. 19/2: 305 (1975)).

Vernacular name: Comet grass (E).

Note: This species is here first reported for continental Asia based on the following specimens from Vietnam present in L: *d'Alleizette* 2033 (Hanoi), *Balansa* s.n. (27 Oct.

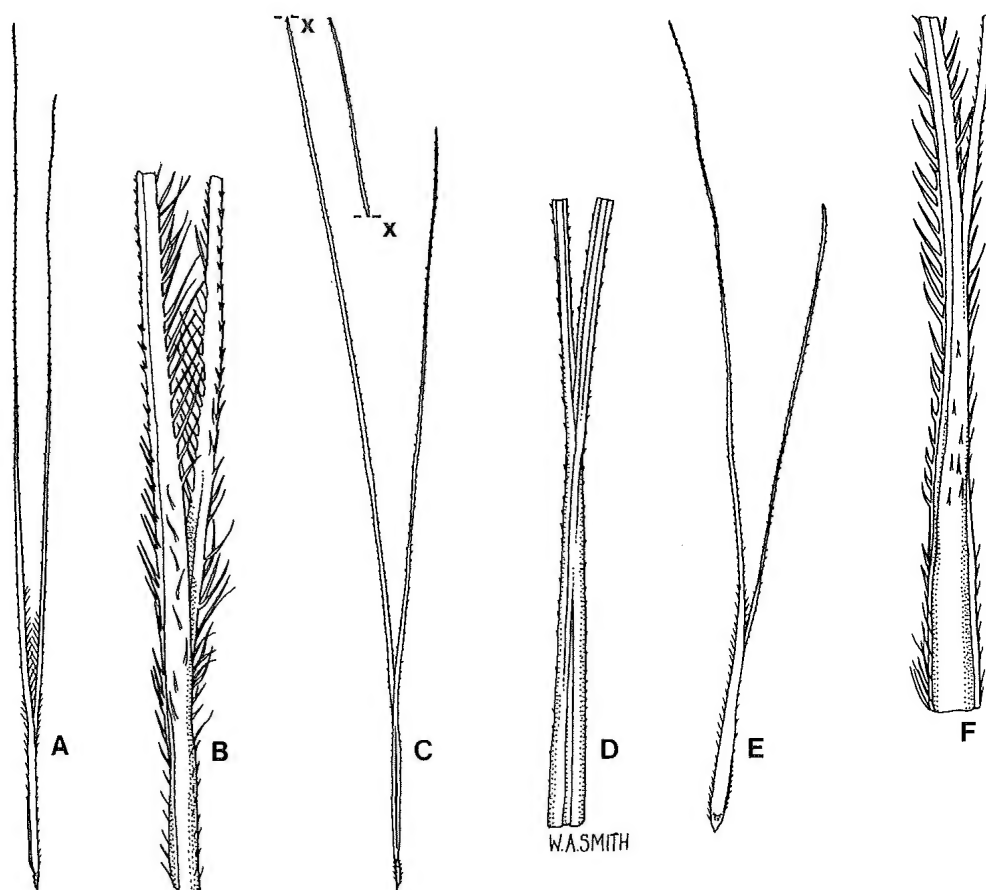


Fig. 2. Intermediate specimen between *Perotis rara* and *Perotis clarksonii*: A. Spikelet $\times 4$. B. Area at base of awns $\times 16$. C-F. Two specimens of *Perotis rara*. C,E. Spikelets $\times 4$. D,F. Area at base of awns $\times 16$. A,B, Thorne 21162, BRI; C,D Clarkson 5453, BRI; E,F Clarkson 5707, BRI.

1876, Quinhon), *Balansa* 378 (Baie de Fi-tsi-long), and *Robinson* 1039 (Natrang). It is also recorded for Taiwan (as *P. macrantha*) and China (as *P. longiflora* and *P. patula*).

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**STUDIES IN EUPHORBIACEAE A.L. JUSS., SENS. LAT. 2*.
A REVISION OF *NEOROEPERA* MUELL. ARG. & F. MUELL.
(OLDFIELDIOIDEAE KÖHLER & WEBSTER, CALETIEAE
MUELL. ARG.)**

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Summary

Neoroepera is endemic in central-eastern and north-eastern Queensland, Australia. It contains two species, namely *N. banksii* Benth. and *N. buxifolia* Muell. Arg. & F. Muell. A lectotype is chosen for *N. buxifolia*. Placement of the genus in Caletieae Muell. Arg. rather than Phyllanthae Dumort. is justified on grounds of its spinulose pollen and attributes of flowers, fruit and seed. Comments on dates of publication of parts of *Adansonia* 6 (1865–6) are given in Appendix 1.

Introduction

The genus *Neoroepera* was established by Johannes (Jean) Mueller (Mueller Argoviensis) and Ferdinand Mueller in the former's contributions on Euphorbiaceae to the de Candolles' great 'Prodromus' (Mueller 1866). It was accepted as containing only one species, *N. buxifolia*, which was based on two specimens collected in central-eastern Queensland by Edward McArthur Bowman (1826–1872) for the latter Mueller, in Melbourne. By 1863, these specimens had reached the de Candolle herbarium in Geneva, Switzerland (G-DC), in time for the former Mueller's study.

Since publication of *Neoroepera* and *N. buxifolia*, only one other species belonging to the genus has been recognised; that was named *N. banksii* and dealt with by Bentham in his 'Flora Australiensis' (1873).

Origin and author of name *Neoroepera*

The two specimens on which *N. buxifolia* is based are both mounted on the one sheet in G-DC. Duplicates of these collections are in MEL where again they are mounted on the one sheet (MEL 697068). A note by Bowman on that sheet indicates, however, the most likely course of events in relation to his material is as follows. To Mueller, in Melbourne, he sent flowering twigs with both copious male and a few female flowers (but no fruit or seed) from plants he found in central eastern Queensland. Mueller thought these specimens were from a new species of *Flueggea* Willd. so labelled them '*Flueggea buxifolia* F.M.' Later, Bowman sent fruiting and seed material of these plants to Mueller which then convinced him they were from a new species of *Roeperia* Sprengel, or possibly of a new genus (he tentatively named '*Flueggella*'), so annotated them either '*Roeperia buxifolia* J. & F. Mueller' (MEL) or '*Roeperia* (oder *Flueggella*) *buxifolia*' (G-DC).

Bowman's note at MEL reads "55./Princhester./I sent this in flower in a former collection." My experience with plants of this species growing in the Marlborough area is that ones copiously flowering do not have many fruit with mature seed at the same time and vice versa. Thus the material on sheets at G-DC and MEL must have been collected on two different occasions as Bowman indicated. Mueller, in his usual fashion, distributed material to Geneva, Paris and to Kew in London, and probably other places too, to assist workers then writing up groups of the Euphorbiaceae. In publishing *Neoroepera*, based on the material in Geneva, Johannes accorded Ferdinand joint authorship, though there is no evidence the latter was involved in selecting the name or preparing the protologue. Indeed, Bentham (1873), working with Kew material, accorded Mueller Argoviensis sole authorship of both the generic and species names and

*Study number 1, a revision of *Amperea* Adr. Juss., was published in *Australian Systematic Botany* 5: 1–27 (1992).

cited F. Mueller's manuscript '*Roepera buxifolia*' in the synonymy of *N. buxifolia* when dealing with the species. Hutchinson (1969) and Webster (1975) followed Bentham in accepting only Mueller Argoviensis as author of the generic name, but this seems contrary to the latter's wishes. As Johannes Mueller appears responsible for the generic name (he treated *Roeperia* Sprengel as a synonym of *Ricinocarpos* Desf. when publishing *Neoroepera*) and Ferdinand Mueller for the specific epithet, their wishes for joint authorship should be respected.

History of Classification

When formally describing *Neoroepera* with Ferdinand Mueller, Mueller Argoviensis (1866)¹ grouped the genus with *Hemicyclia* Wight & Arn. and *Cyclostemon* Blume within his subtribe Cyclostemoninae² in tribe Phyllanthae Dumort. Though *Cyclostemon* and *Hemicyclia* are now considered congeneric with *Drypetes* Vahl and in the distinct tribe Drypeteae (Griseb.) Hurusawa, Mueller considered *Drypetes* belonged in his subtribe Securineginae ('Securinegeae') within tribe Phyllanthae. To him, this tribe fundamentally contained euphorbs with the lobes of the male perianth imbricate, anthers erect in bud, ovaries with 2-ovulate locules, and cotyledons two or more times wider than the radicle. Subtribe Cyclostemoninae was attributed flowers without petals and commonly in clusters, and with stamens inserted round and from below a central disc. While this gave Mueller a practical, rather simplistic grouping of relevant genera, it failed to take into account several other attributes now considered critical for indicating relationships of the genus *Neoroepera*. Besides, the anthers in *Neoroepera* are transverse on the apex of the filaments, somewhat similar to those in *Micrantheum* Desf. and *Beyeria* Miq. (though held vertical in bud), but not like the erect ones in *Phyllanthus* and its allies.

From Stafleu and Cowan (1976, p. 97), it could be inferred that Baillon (1866) was the first to provide a name for the taxon here treated as genus *Neoroepera* when he described it as section *Neoroepera* of genus *Securinega* Juss. and named its sole species *S. muelleriana*. Though it seems this publication dates from July 1866, the relevant pages of 'Adansonia' probably appeared in September of that year (Appendix 1), some weeks after Mueller's publication. Thus, his *Sauropus* sect. *Neoroepera* is a new combination of the Muellers' *Neoroepera*, and his *S. muelleriana* is an illegitimate name (Greuter *et al.* 1988) provided for Bowman's Princhester Creek specimens.

Bentham (1873) maintained *Neoroepera*, on the basis of flowers of both sexes with a perianth, embryo with broad cotyledons and a narrow radicle, and two ovules in each ovary locule, in tribe Phyllanthae but did not recognise subtribes within that. He later (Bentham 1883) maintained *Neoroepera* within Phyllanthae but there associated it with several genera such as *Phyllanthus* L. (in a very broad sense), *Sauropus* Blume and *Securinega* Juss., none of which is now considered closely related to it.

The association of *Neoroepera* with *Phyllanthus* and its allies in the Phyllanthae persisted apparently until Hutchinson (1969) segregated it into the Drypeteae (Pax) Hutchinson (correctly Drypeteae (Griseb.) Hurusawa according to Webster 1975). As Hurusawa (1954) did not name *Neoroepera* anywhere in his account of the Euphorbiaceae, it is not clear where he intended it to be placed though presumably it remained within tribe Phyllanthae and covered by the 'etc.' in his list of genera included in that tribe. Hutchinson's segregation was prompted, no doubt, by Pax's inclusion of *Neoroepera* in subtribe Drypetinae of Phyllanthae in 1890 (Pax & Hoffman 1931) based, seemingly, principally on the disc in male flowers in *Neoroepera* being central. This genus invariably has carunculate seeds and *N. banksii* is a dioecious species. Pax apparently did not know that pollen of *Neoroepera* is spiny, fundamentally different from the non-spiny pollen of *Drypetes*. Thus this genus' association with *Drypetes*, persisting from 1866 when the Muellers first described it, was perpetuated by Hutchinson even though he dissociated it from *Phyllanthus*.

With his different approach to classification within Euphorbiaceae, Webster assessed more than the traditional attributes used to divide the family and produced a new

¹ Published in late August 1866 according to Stafleu & Cowan 1976, p. 447.

² 'Cyclostemonae' Muell. Arg. (1865), equivalent to 'Cyclostémonées' of Baillon (1858).

classification of it (Webster 1975) based primarily on ovule numbers per ovary locule, morphology of pollen and other data from such fields as wood anatomy, cytology and biochemistry. Thus, based on the paired ovules in each ovary cell, the spiny pollen and carunculate seed, Webster grouped *Neoroepera* with *Micrantheum* Desf., *Pseudanthus* Sprengel and *Stachystemon* Planchon in Caletieae within sub-family Oldfieldioideae, totally dissociating it from *Phyllanthus* and *Drypetes* which he retained in subfamily Phyllanthoideae. Webster later admitted (1987) that his classification is by no means definitive or wholly satisfactory, for much information to test the robustness of his scheme is lacking. However, in the case of *Neoroepera* it seems logical to associate it with at least *Micrantheum* wherever that is placed, because, besides sharing the attributes

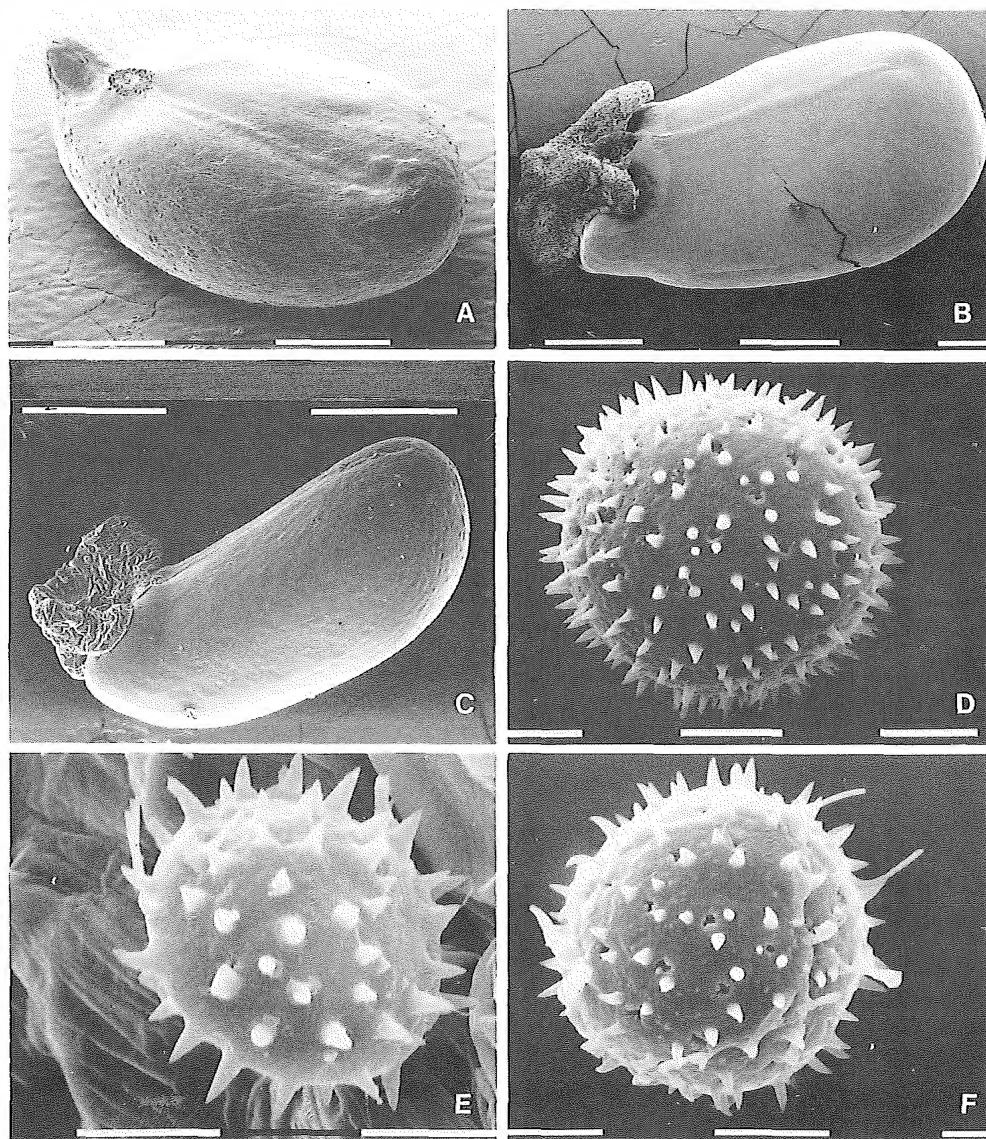


Fig. 1. Scanning electron micrographs of *Neoroepera* and *Micrantheum* pollen and seed: A. seed of *N. buxifolia*. B. seed of *N. banksii*. C. seed of *M. ericoides*. D. pollen grain of *M. hexandrum*. E. pollen grain of *N. banksii*. F. pollen grain of *N. buxifolia*. A, Bowman 55, MEL; B, Staples 2213, BRI; C, SW slopes of Mt Coolum, Qld, Nov 1987, Henderson H 3111, BRI; D, Prosser River, Tas, Sep 1972, Jarman [AQ380673], BRI; E, Scarth-Johnson 1459A, BRI; F, Anderson 2361, BRI. Scale bar A-C = 1 mm, D-F = 10 µm.

of two ovules per locule, spiny pollen (Fig. 1), and carunculate seed (Fig. 1) with that genus, it has a petaloid, single-whorled perianth, bilocular anthers transverse on the filaments, a central, gland-like disc lobed between the stamen filaments in male flowers, styles that are entire (though somewhat dorsio-ventrally expanded rather than more or less terete), and seeds somewhat tumid proximally about the hilum (at least in *N. banksii*) as do *Micrantheum* species. Thus, Webster's transfer of *Neoroopera* to Caleticeae seems fully justified and is accepted here.

This close relationship of *Neoroopera* with *Micrantheum* was noticed by F. Mueller who annotated a Walter specimen of *N. banksii* from Lizard Island in 1871 (MEL 697066) as '*Neoroopera micrantheoides*' and commented that the plant was "*similis Micrantheum hexandrum*", though he (? later) incorrectly accepted that the plants represented *N. buxifolia* 'J. M. & F. M.'.

Whether or not the Oldfieldioideae warrants family status (as Paivausaceae) as suggested by Meeuse (1990), will have to wait till a more detailed study of the Euphorbiaceae *sens. lat.* is undertaken.

Origin of central structure in male flowers

The finding of a flower with a pistilode in a specimen of male *N. banksii* (Gittins 1833, in BRI and NSW), an attribute that occasionally occurs in the family (Baillon 1858; Webster 1984) but not to my knowledge recorded for *Neoroopera* before, helps clarify the nature of the central structure in male flowers. In this particular flower, the ovary, complete with three typical styles and stigmas but with the ovules abortive, arises from the centre of a gland-like, lobed structure otherwise typical of male flowers of this genus, that is, internal to the stamens and lobed with the lobes protruding between the filaments. Thus, the central structure found in male flowers of *Neoroopera* is homologous with the disc that subtends the ovary in female flowers and as such confirms traditional thought that it is a disc internal to the stamens, not a vestigial gynoeceum as suggested by Baillon (1866).

Taxonomy

Neoroopera Muell. Arg. & F. Muell. in DC., Prodrum 15(2): 488 (August 1866); *Securinea* section *Neoroopera* (Muell. Arg. & F. Muell.) Baillon, Adansonia 6: 333 (September 1866). **Type:** *N. buxifolia* Muell. Arg. & F. Muell.

Derivation of name: Named from Greek *neos*, new, and '*Roepera*' after the generic name *Roeperia* Sprengel (a later synonym of *Ricinocarpos* Desf. also in the Euphorbiaceae) which honours Johann August Christian Roeper, German botanist, who, in the 1860s, was a professor at Basel (then Rostock) and who published on the Euphorbiaceae of Germany and Hungary (Baines 1981).

Shrubby monoecious or dioecious perennials with stems erect or ascending, branching, the branches leafy throughout. Leaves alternate, stipulate, shortly petiolate, persistent or caducous. Stipules entire. Flowers pedicellate, solitary or paired or in clusters or short spikes (reduced branchlets) in leaf axils, subtended by minute bracts; perianth lacking a corolla, petaloid, of several imbricate lobes; lobes dimorphic, usually a small sepal-like one alternating with a larger, petal-like one, \pm free. Male flowers 6 (rarely 4, 5, 7 or 8)-merous; perianth lobes entire, emarginate, ciliate or shortly erose; a whorl of few to many, discrete, finger-like glands present between tepals and stamens; stamens exserted; anthers of two, separate, obloid, parallel but contiguous locules each transverse on the apex of a reduced lobe of the shortly bifid filament, dehiscing by longitudinal slits; disc a central, squat, \pm sessile, lobed structure embracing base of filaments. Female flowers 6(-8)-merous; perianth persistent, of \pm distinct, imbricate lobes; lobes appressed to ovary but spreading in fruit, entire or somewhat ciliate or erose on upper margins; glands in two whorls, the outer of few, discrete finger-like lobes, the inner of discrete, flattened, irregular lobes on a continuous rim. Ovary 3 (rarely 4)-celled with two pendant ovules from an enlarged placenta in each locule; styles 3 (rarely 4), \pm free from the base, sulcate adaxially, horizontally spreading at first but becoming erect or ascending with age, entire, the distal portion expanded and dorsio-ventrally flattened into a large stigmatic zone.



Fig. 2. *Neoroepera banksii*: A. apical portion of stem from male plant showing axillary flower clusters $\times 2$. B. male flower $\times 6$. C. apical portion of stem with long narrow leaves, from female plant $\times 2$. D. female flower from side showing solitary pedicel, perianth lobes and bracts $\times 4$. E. ovary from above showing styles and distally flattened, broad, stigmatic portions $\times 8$. F. sub-mature fruit viewed from the side showing pedicel and persistent styles and perianth $\times 2$. G. apex of stem with short broad leaves $\times 2$. A,B, Gittins 1833; C-E, Ross [AQ473929]; F, Scarth-Johnson 1271A; G, Isbell [AQ204124]. All BRI.

Fruit capsular, separating septicidally into three 2-valved cocci. Seeds somewhat curved, becoming dorsi-ventrally flattened at maturity, smooth or minutely pitted, carunculate, pale to dark brown when mature (and containing embryo); caruncle whitish to reddish, waxy-fleshy; endosperm copious; cotyledons several times broader than the radicle.

A genus of 2 species endemic in tropical eastern Australia.

Key to species of *Neoroepera*

1. Plants dioecious; leaves broadest above the middle; perianth lobes of male flowers virtually smooth on margins; stamen filaments spreading hairy to above the middle; stigma limb much wider than long; far north Queensland **1. *N. banksii***
- Plants monoecious; leaves broadest at or below the middle; perianth lobes of male flowers ciliate on margins; stamen filaments glabrous, smooth or sparsely papillose proximally; stigma limb \pm longer than wide; central Queensland **2. *N. buxifolia***

1. *Neoroepera banksii* Benth., Flora Australiensis 6: 117 (1873). **Type:** Queensland, sandy ridges, north shore, Endeavour River, *A. Cunningham* (holo: ?K n.v.; iso: MEL).

Dioecious shrubs (0.15–)0.5–2 m high. Stems smooth, rounded, shortly spreading-hairy when young, later glabrescent. Leaves evenly spaced along stems and branches, spreading; petiole 1.0–1.2 mm long, shortly curved hairy adaxially and abaxially; blade oblanceolate to very narrowly obovate or \pm spatulate, broadly obtuse or emarginate at tip and shortly attenuate to base, 6–16 mm long, 1.0–6.8 mm wide, smooth except for raised nervation, and glabrous except for short curved hairs proximally on midrib and around recurving tip above, smooth and glabrous below; midrib produced as a short, recurving, usually reddish subula from the emarginate tip; margins entire, a little thickened and recurving. Stipules dark red at least distally, narrowly triangular with tip acute, 0.3–1.0 mm long and to c. 0.3 mm wide; margins glabrous to densely hairy. Flowers single or in few-flowered clusters, subtended by numerous bracts similar to but smaller than stipules. Male flowers solitary or in pairs or threes, shortly pedicellate, 6–8-merous; pedicels 6.0–9.5 mm long in flower to c. 18.0 mm long in fruit. Perianth spreading; lobes ovate to obovate with tips rounded and entire or erose, and margins entire or few toothed, sepal-like ones 0.8–1.3 mm long and 0.6–0.8 mm wide, somewhat concave, the petal-like ones 2.0–2.3 mm long and 1.7–1.9 mm wide, dishd; glands of the outer whorl to c. 0.15 mm long. Stamens 6–8; filaments stout, 1.9–2.4 mm long, spreading long hairy in the lower three quarters; anthers 0.85–1.00 mm long; glandular disc c. 0.9 mm across and 0.3 mm high; pistilode rarely present. Female flowers solitary, pedicellate; pedicels 9–15(–25) mm long in flower, to c. 30 mm long in fruit. Perianth spreading, persistent and reflexed beneath fruit; lobes semi-elliptic to oblong to obovate, with margins entire, the sepal-like ones 1.4–2.4 mm long and 0.8–1.3 mm across and rounded or acute at the apex, smooth or ciliate on margins, the petal-like ones 2.5–3.4 mm long and 1.2–1.6 mm across, and cucullate acute at the apex, smooth or ciliate distally on margins; glands of the inner disc forming a continuous, flattened, 3-lobed ring at base of the ovary, the lobes \pm triangular and to c. 0.7 mm long. Ovary ovoid, c. 1.5 mm high and 1.75 mm across; styles stout, with column 0.5–0.7 mm long, and flattened limb \pm reniform in outline, c. 1.6–2.2 mm across. Fruit ovoid, to c. 6.5 mm long, at first conspicuously crowned with the 3 (or 4) long-persisting styles, reddish green when mature. Seed \pm obloid, a little tumid proximally (around hilum), 4.0–4.7 \times 2.2–2.7 \times 2.2–2.7 mm, longitudinally striate with lines of minute fovea, later smooth; caruncle irregularly shaped and \pm coralloid (dried state). **Figs 1, 2.**

Selected specimens (63 examined): **Queensland.** COOK DISTRICT: 5 km NE of Bamaga airstrip, Aug 1978, *Pajmans* 3020 (♀) (BRI,CANB); 11°35'S, 142°27'E, vicinity of McDonnell, Jul 1970, *Isbell* [AQ204125] (♀) (BRI); ditto, *Isbell* 14 (sterile) (BRI); 11°36'S, 142°46'E, between Heathlands homestead and Captain Billy beach, May 1980, *Morton* 638 (♀) (BRI,MEL); 12°07'S, 143°05'E, Olive River, near mouth, Sep 1974, *Tracey* 14494 (♀) (BRI); c. 34 km from 'Bromley' along road to Bolt Head, 11 km from Olive River crossing turnoff, Jul 1990, *Ross* [AQ473929] (♀) (BRI); 14°08'S, 143°21'E, c. 48 miles [77 km] N of Musgrave Telegraph Station, *Gittins* 1833 (♂) (BRI) (♂ & ♀) (NSW); Lizard Island, in 1871, *Walter* (MEL); ditto, May 1975, *Byrnes* 3146 a(♀) & b(♂) (BRI); ditto, Jul 1990, *Batianoff* 12186 (♀) (BRI); Hopevale, Jul 1977, *Scarth-Johnson* 545A (♀) (BRI); 15°17'S, 145°19'E, 3 km SW of South Cape Bedford, Aug 1978, *Kanis* 1928 (♀) (BRI,CANB); Cooktown, mouth of Endeavour River, Jun-Aug

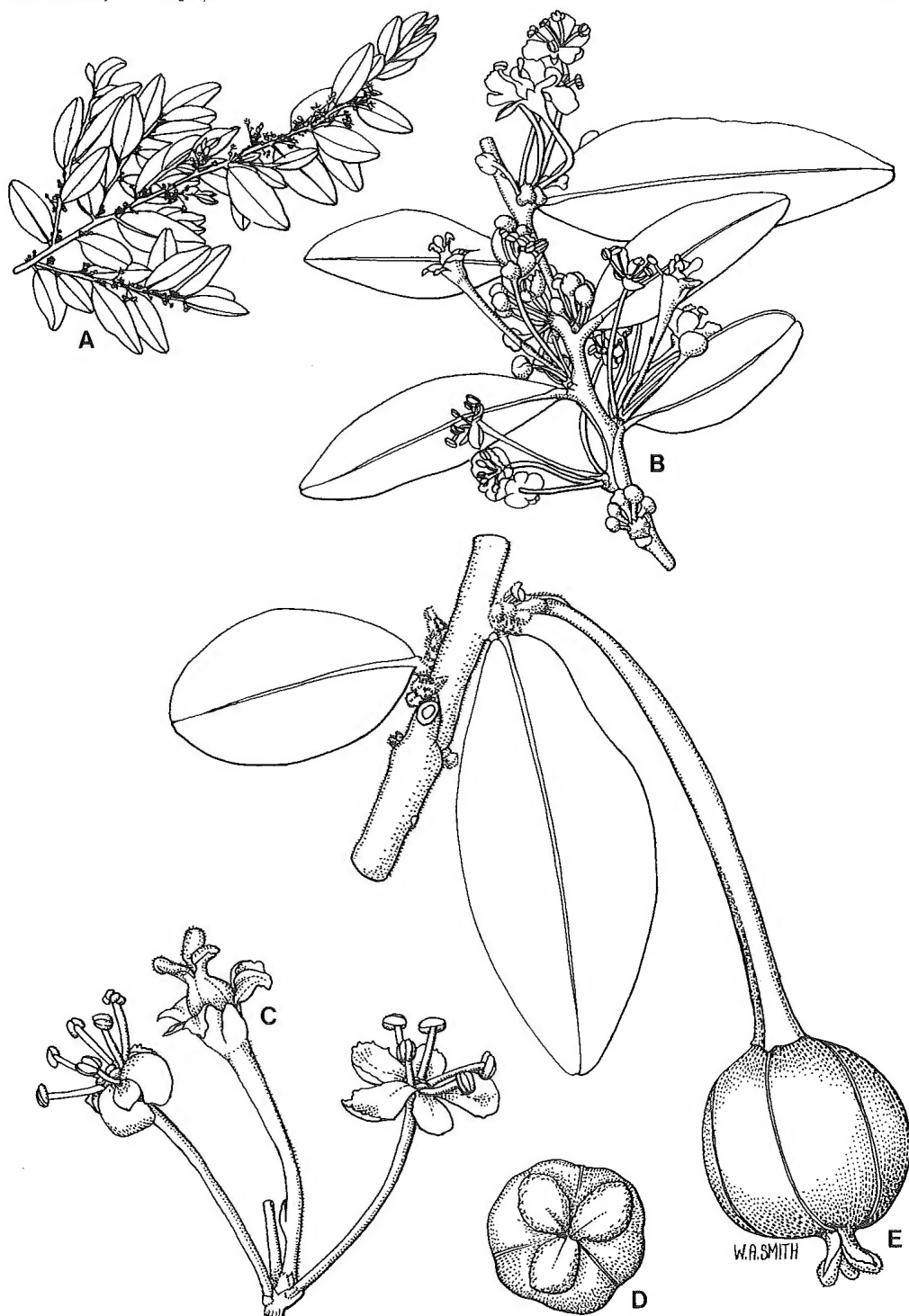


Fig. 3. *Neoroepera buxifolia*: A. apical portion of a flowering branch $\times 0.33$. B. portion of a twig showing clusters of male and female flowers $\times 2$. C. partial cluster of flowers showing central female and surrounding male flowers - note 5- and 6-merous male flowers $\times 4$. D. ovary from above showing styles with distal, flattened, stigmatic portions $\times 8$. E. portion of a stem showing sub-mature fruit with persistent styles $\times 4$. A-E, Batianoff MC9108001 & Robins, BRI.

1770, *Banks & Solander* [AQ450766/MEL 515923] (♀) (BRI,MEL); ditto, May 1970, *Blake* 23311 (♀ & ♂) (BRI,MEL); 15°34'S, 147°34'E, approximately 1 km S of Annan River mouth, Aug 1974, *Tracey* 14734 (♀) (BRI,MEL,QRS).

Distribution and habitat: Confined to far north-eastern Queensland north of about Cooktown (**Map 1**). Commonly occurs in sandy soils on or close to the coast, in dune communities or *Eucalyptus* forest on the landward side of coastal sand-dunes.

Notes: The variability in leaf shape suggests that at least two infraspecific taxa can be recognised so distinctive are the extremes. The most northerly material generally has remarkably small, narrow leaves, e.g. *Isbell* [AQ204125], whereas that from around Cooktown mostly has comparatively longer, quite broad leaves, e.g. *Kanis* 1928. However, since small-leaved forms can also occur near Cooktown, e.g. *Scarth-Johnson* 545A, and broader leaved ones near Cape York, e.g. *Isbell* 14 (**Fig. 2G**), and forms that cannot be grouped with either the above with certainty, e.g. *Tracey* 14494, occur throughout the species' range, no attempt has been made to formally recognise this variability. The MEL isotype has leaves within the range of small/narrow to large/broad somewhat closer to the large than small end of the range. There seems no qualitative differences between leaves of the different forms.

Notes accompanying *Batianoff* 12186 indicate this species has horticultural potential as it is in cultivation on Lizard Island where it is described as a spectacular ornamental because of its striking red mature fruits.

Risk coding: This species is evenly distributed throughout its range and can be classed as common. It is conserved in at least the Lizard Island National Park and is not at risk.

2. *Neoroepera buxifolia* Muell. Arg. & F. Muell. in DC., *Prodromus* 15 (2): 489 (August 1866). **Type:** In New Holland at 'Prenchestic' [= Princhester] Creek [Queensland], *Bowman* (lecto chosen here: G-DC *n.v.* [BRI-microfiche IDC 800-74. 2508: I, 2], twig bearing male and (?)female flowers; isolecio: MEL).

Securinega muelleriana Baillon, *Adansonia* 6: 333 (September 1866), *nom. illeg.*
Based on *Neoroepera buxifolia* Muell. Arg. & F. Muell.

Monoecious shrubs or small trees to c. 6 m high. Stems smooth, at first shortly antrorsely ferruginous pubescent later glabrescent, rounded, robust, many-branched with branches spreading or ascending. Leaves evenly spaced along stems; petiole 1.0–2.0 mm long; blade narrowly to broadly ovate to elliptic (or occasionally orbicular), with margins slightly thickened and a little recurving, tapered to broadly obtuse and a little emarginate tip and also to base, 10.0–40.0 mm long, 6.5–20.0 mm wide, smooth above and below; midrib produced as a spreading, microscopic subula from the emarginate tip; margins entire, smooth. Stipules subulate, to c. 0.3 mm long, glabrous, reddish, caducous. Flowers clustered along short axis, subtended by numerous microscopic, semi-circular to triangular, externally appressed-hairy bracts. Male flowers several in each cluster, pedicellate, (4, 5 or) 6 (or 7)-merous; pedicels 4.5–8.0 mm long. Perianth ± crateriform; lobes ovate to obovate with tips rounded and entire, emarginate or erose, and margins regularly ciliate, sepal-like ones 0.75–1.8 mm long and 0.65–1.2 mm wide, somewhat cupular, the petal-like ones 2.2–3.2 mm long and 1.5–2.5 mm wide, dishd; disc of many, spreading filiform, entire or bifid or secondarily lobed lobes up to 1.5 mm long. Stamens (4, 5 or) 6 (or 7); filaments straight, glabrous, smooth or sparsely papillate, 1.7–3.6 mm long, incipiently bifid distally; anthers ellipsoidal, 0.7–1.2 mm long. Female flowers solitary, apical on a short axis with several male flowers below it, pedicellate; pedicels to c. 8.5 mm long in flower, to c. 18 mm long in fruit, stouter than that of males, shortly antrorsely hairy throughout but denser distally, glabrescent, bracteolate near or below middle; bracteoles ± ovate, to c. 0.5 mm long. Perianth ± crateriform, persistent and somewhat reflexed beneath fruit; lobes narrowly ovate to oblong, rounded at the apex, and with margins shortly ciliate, the sepal-like ones 1.2–1.5 mm long, 0.75–1.1 mm across, the petal-like ones 2.5–2.8 mm long and 1.7–1.9 mm across. Ovary ± ovoid, to c. 1.5 mm long; styles stout, adnate only near base, ascending, with column c. 0.5 mm long, and flattened limb ± narrowly ovate in outline, c. 1 mm long, its margins revolute. Fruit obloid to obovoid, 5–8 mm long, at first conspicuously crowned with the 3 long-persisting styles, olive green (?) at maturity. Seed ± obloid to ovoid becoming dorsiven-

trally flattened with maturity, $4.2\text{--}5.1 \times 2.1\text{--}3.3 \times 1.7\text{--}2.3$ mm, smooth but with contiguous minute fovea visible below surface of testa; caruncle reduced to a small, red-coloured flap or cone-shaped outgrowth of tissue from testa that abutted the hook-like placenta. **Figs 1, 3.**

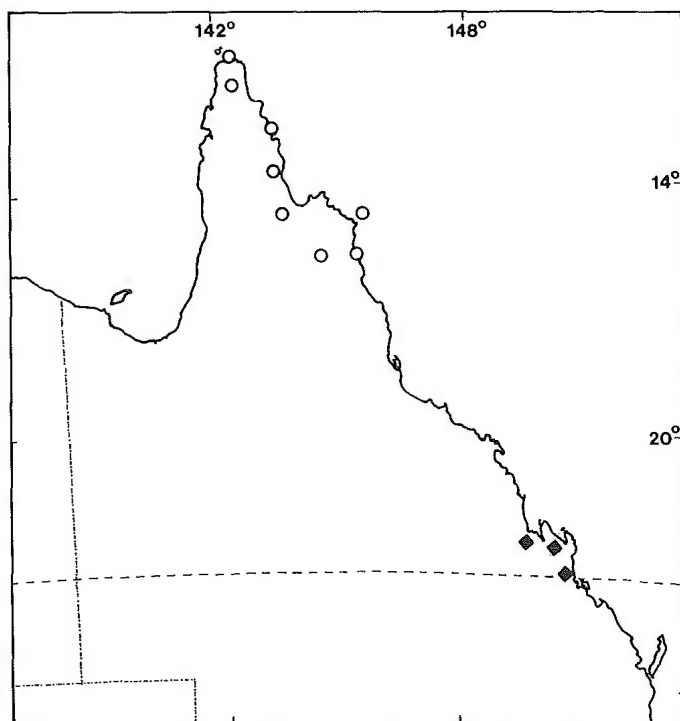
Specimens examined: Queensland. PORT CURTIS DISTRICT: between Marlborough and Yaamba, Oct 1937, *White* 12095 (BRI); Livingstone Shire, about 11 km S of Marlborough homestead, at Marlborough Creek crossing, Nov 1981, *Anderson* 2361 (BRI); $22^{\circ}58'S$, $149^{\circ}52'E$, Marlborough Creek Crossing, Mar 1989, *Reeves* 630 (BRI); ditto, May 1991, *Batianoff & Franks* (BRI); $23^{\circ}04'S$, $150^{\circ}15'E$, just W of Canoona, c. 45 km NW of Rockhampton, on road to Mona Vale, Nov 1990. *Henderson* H3490 & *Robins* (BRI,K,MEL,NSW)

Distribution and habitat: Known only from a few creek-side localities north-west of Rockhampton in the Port Curtis pastoral district, in areas of serpentinite soils (**Map 1**).

Notes: As explained above, the sheet of type material at G-DC, as well as that at MEL, contains material of *Neoroepera buxifolia* collected on two different occasions. Thus each of the two specimens on the G-DC sheet is a syntype while those at MEL are isosyntypes. To be sure of the application of the name, Bowman's flowering specimen at G-DC, as opposed to the fruiting material there, is selected as its lectotype.

The duplicate material distributed to K was cited by Bentham (1873). That loaned to Baillon in Paris was obviously examined and reported on to Mueller prior to Baillon's publication of 1866, for annotation on the MEL sheet reads '*Securinega muellerii* Baill'. That name was not published but *Securinega muelleriana* was. However, as it was proposed as a later alternative for *Neoroepera buxifolia* it is not a legitimate name.

This species appears restricted to the bed and banks of creeks in areas of outcropping ultramafic (serpentine) rock which itself is, in central Queensland, restricted largely to the Yaamba to Marlborough area, with a second, though somewhat smaller, occurrence between Rockhampton and Yeppoon. Thus the species could be expected to be found at other creek-side situations where serpentinite soils occur in this area.



Map 1. Distribution of *Neoroepera* species: ○ *N. banksii*. ◆ *N. buxifolia*.

Risk coding: Though this plant is quite common in the riparian habitat it is confined to, it is restricted in occurrence at any one site. None of the known sites of occurrence is within any declared conservation reserve though the plant is known to occur within one State Forest. Most sites are subject to roadside clearing and/or grazing, and none of them is more than 50 km from the others. The species must, therefore, be considered vulnerable. A risk coding of 2V, as recorded by Briggs and Leigh (1988), is thus still appropriate.

Acknowledgements

The Directors of MEL and NSW are thanked for loan of their holdings of *Neoroopera* (including types from MEL) to BRI for study. I am grateful to Will Smith for producing the illustrations and maps, and to Andrew Franks and Hans Dillewaard for the SEM photomicrographs. George Batianoff, Paul Robins and Andrew Franks collected pickled material of *N. buxifolia* for me for illustration purposes. Support by grants from the Australian Biological Resources Study (ABRS) for my 'Stenolobeae' studies since 1988 is gratefully acknowledged.

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Appendix 1

It is reasonable to assume from Stafleu and Cowan (1976) that Baillon's publication dealing with *Neoroopera* in *Adansonia* appeared in July 1866, before that of Mueller Argoviensis. However, Dr Grady Webster (pers. comm.) has pointed out that since Baillon cited actual page numbers in his reference to de Candolle's *Prodrömus* under *Securinega muelleriana*, and considering the personal relationship between Mueller and himself, it is likely his publication appeared after Mueller's (late August 1866).

Despite what may be inferred from the title page and from Stafleu and Cowan, it seems clear that for Volume 6 of 'Adansonia', the publication schedule slipped beyond August 1866. Though parts comprised of 32 pages may have appeared monthly in early volumes, it is clear that the journal was produced in fascicles of 16 pages which were numbered consecutively in each volume in the bottom right-hand corner of the first page of that fascicle, and did not necessarily appear two per month. In Volume 6, though fascicles 1 to 11 are undated, fascicles 12 to 24 carry a date (presumably of publication) in the bottom left-hand corner as follows.

| Fascicle | Pages | Date | Fascicle | Pages | Date |
|----------|---------|-------------|----------|---------|-------------|
| 12 | 177-192 | 07 Oct 1865 | 19 | 289-304 | 30 Aug 1866 |
| 13 | 193-208 | 11 Mar 1866 | 20 | 305-320 | Sep 1866 |
| 14 | 209-224 | 11 Mar 1866 | 21 | 321-336 | Sep 1866 |
| 15 | 225-240 | 18 May 1866 | 22 | 337-352 | Sep 1866 |
| 16 | 241-256 | 12 Jun 1866 | 23 | 353-368 | Oct 1866 |
| 17 | 257-272 | 12 Jul 1866 | 24 | 369-384 | Oct 1866 |
| 18 | 273-288 | 30 Jul 1866 | | | |

Thus fascicles 18 to 22 of this volume, covering Baillon's paper on Australian euphorbs, apparently appeared over two months with the critical fascicle (number 21) appearing in (probably) mid to late September 1866, indeed later than Mueller's. Incidentally, though Volume 7 fascicle 1 is undated, Volume 7 fascicle 2 is also dated September 1866.

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TAXONOMIC STUDIES ON THE GENUS *HOYA* R. BR. (ASCLEPIADACEAE) IN PAPUASIA, 1-5

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Summary

1. The group of species of *Hoya*, known colloquially as 'New Guinea Whites', is revised. This group includes *H. albiflora* (Zipp. ex Blume) Boerl., *H. magnifica* P. Forster & Liddle sp. nov., *H. naumanii* Schltr., *H. australis* subsp. *tenuipes* (K. Hill) P. Forster & Liddle and *H. calycina* Schltr. Two subspecies are recognised for *H. calycina* with subsp. *glabrifolia* P. Forster & Liddle newly described. 2. *H. pottsii* Traill is lectotypified and *H. nicholsoniae* F.Muell., *H. hellwigiana* Warb. and *H. sogerensis* S. Moore are placed in synonymy. 3. *H. anulata* Schltr. is found to be the earliest name for the taxon described as *H. schlechteriana* S. Moore, *H. poolei* C.White & Francis, *H. pseudolittoralis* C. Norman or *H. alata* K. Hill. 4. *H. revoluta* Wight ex J.D. Hook. is found to be the earliest name for the taxon described as *H. littoralis* Schltr., *H. inconspicua* Hemsley or *H. dodecatheiflora* Fosb. 5. *H. sussuela* (Roxb.) Merr. is the earliest name for a widespread taxon to which the name *H. lauterbachii* Schumann has been previously misapplied. *H. holtrungii* Warb. and *H. coronaria* var. *papuana* Bailey are placed in synonymy of *H. sussuela*.

Introduction

Approximately eighty published names have been applied to species of *Hoya* R. Br. in Papuasias (Irian Jaya, Papua New Guinea, Solomon Islands). An account of the genus in German New Guinea (now part of Papua New Guinea) was provided by Schlechter (1913) who utilised mainly his own field collections. There is no overall account of the genus in Papuasias and many species have been subsequently described without reference to previously described taxa (e.g. Moore 1916).

Despite this early taxonomic activity, there is considerable confusion as to the identity of the taxa present in the region. A large number of unidentified collections have accumulated in herbaria, mainly as a result of the collecting activities of officers of the Department of Forests, Lae (NGF and LAE series) and the Archbold expeditions. The primary set of the NGF-LAE collections is at the National Herbarium of Papua New Guinea (LAE), with the second set at the Rijksherbarium, Leiden (L), the third set at the Queensland Herbarium (BRI), and minor sets at other herbaria such as the Australian National Herbarium (CANB). The collections of L.J. Brass (Archbold expeditions) are distributed in several herbaria with primary sets mainly at the Arnold Arboretum, Harvard (A), New York Botanic Gardens (NY) and L, with minor sets of some numbers at BM and BRI.

While there are many collections of *Hoya* available, few have been identified fully. This is undoubtedly a result of the lack of a comprehensive revision and key to the species. Also, it has been assumed that the types for many of the species described by Schlechter were destroyed in the firebombing of the Berlin Herbarium (B) in 1942. However, this is not the case and most are still extant in B (B. Leuenberger, pers. comm. 1988). Unfortunately, the same cannot be said for the species named by Engler, Schumann or Warburg. Very few duplicates of type collections relevant to taxa named by these workers have been located. Although the large number of published names does not give an accurate picture of the actual number of species of *Hoya* present in Papuasias, the region, nevertheless, does have a rich diversity of taxa comprising approximately 70 species.

From examination of Papuasian holdings at the herbaria A, BO, BM, BISH, BRI, CANB, L, LAE, MEL, NY and SING, and relevant type material at K, P and WRSL, it is evident that some of the taxa collected and named by Schlechter, often from single collections, have not been recollected in more recent times. Conversely there are

collections, particularly from Irian Jaya and southern Papua New Guinea that represent undescribed taxa not seen by him.

A comprehensive revision of the genus in this region will require extensive field work and cultivation of field-collected material which will take many years. In the interim we believe we have been able to match a significant proportion of existing herbarium collections with the types from various taxa. These identifications have represented significant changes to known distribution records of the taxa concerned in the Papuan region and beyond. We believe it to be of some importance to progressively publish these findings, if only to stimulate curation in other herbaria, and to encourage further fieldwork and study. In the long-term we hope to produce a revision of the genus in the region.

At this preliminary stage of our investigations, some comment on nomenclatural priority is necessary. We have previously stated (Forster & Liddle 1990) that for certain widespread taxa, it is possible that earlier legitimate names exist than the ones we previously accepted. Such has proved to be the case with *H. revoluta* Wight ex J.D. Hook., *H. anulata* Schltr., *H. sussuela* (Roxb.) Merr. and *H. pottsii* Traill. which have been found to be earlier names for species previously known by more familiar names.

Notes on Terminology

Indumentum cover is described using the terminology of Hewson (1988), except that 'scattered' is used instead of 'isolated'. In previous papers we have described the glandular structures at the base of the leaf lamina as 'extrafloral nectaries' and those at the sepal sinus bases as 'glands'. However, following the excellent review of the morphology and evolution of the corona and related structures in Asclepiadaceae and allied families by Kunze (1990), we are now calling both these structures 'colleters'.

1. Revision of the 'New Guinea Whites'

In *Hoya* horticulture, there is a group of taxa originating from Papuasias that have been known colloquially as the 'New Guinea Whites'. These taxa have large, showy, usually totally white flowers. Naming of cultivated material of these plants has been hopelessly confused and generally based on ill-informed conjecture of horticulturalists attempting to match original descriptions to live plants without recourse to the types. Much of this confusion has centred on the definition of *H. australis* R. Br. ex Traill. (see Forster & Liddle 1991), *Hoya albiflora* (Zipp. ex Blume) Boerl. and *H. calycina* Schltr. (e.g. Burton 1989). The existence of two undescribed taxa in the group has also added to the confusion.

The present study is based both on live and herbarium specimens.

Key to taxa of 'New Guinea Whites' *Hoya*

1. Flower campanulate; corolla not red under coronal lobes; corolla lobes triangular 2
 - Flower campanulate-rotate; corolla red under coronal lobes; corolla lobes lanceolate-ovate 3
2. Corolla 40–45 mm diameter; lobes horizontal or reflexed, 15–18 mm long *H. magnifica*
 - Corolla 20–25 mm diameter; lobes inflexed, 7–11 mm long *H. albiflora*
3. Staminal column elongated with staminal corona raised well above corolla *H. naumanii*
 - Staminal column not elongated, base of staminal corona situated more or less flush with corolla 4

4. Corolla internally with dense puberulous indumentum of short white hairs; staminal corona lobes 1.2–3.5 mm long **H. australis**
 Corolla internally glabrous or with only scattered puberulous indumentum of short white hairs; staminal corona lobes 3.4–4.8 mm long **H. calycina**

Note: *H. naumanii* Schltr. is restricted to Bougainville and Solomon Islands and will be dealt with in detail in a later publication when recently collected material (June 1991) has been grown on and flowered. *H. australis* subsp. *tenuipes* (K. Hill) P. Forster & Liddle, the only subspecies of *H. australis* present in Papuasias, has been covered previously (Forster & Liddle 1991).

1. ***Hoya magnifica*** P. Forster & Liddle, **sp. nov.** a *H. albiflora* (Zipp. ex Blume) Boerl. corolla 40–45 mm diametro eius lobis 15–18 mm longis reflexis vel horizontaliter portatis differt. **Typus:** Papua New Guinea. MOROBE PROVINCE: Palenkwa, Golden Pines, 7°06'S, 146°35'E, 24 April 1969, *H. Streimann* & *A. Kairo* NGF39381 (holo: CANB!; iso: A!, BO!, BRI!, L!, LAE!; K n.v.)

Liane to several metres long, latex white. Stems cylindrical, with dense indumentum when young, becoming sparse with age; internodes up to 270 mm long and 5 mm diameter. Leaves petiolate, held erect or at angle of 10–20° from vertical; lamina elliptic-ovate to narrow-ovate, up to 190 mm long and 100 mm wide; upper surface with sparse indumentum, venation obscure; lower surface with dense indumentum, venation obscure; tip acute, shortly acuminate to somewhat apiculate; base cordate to rounded; petiole 14–43 mm long, 2.3–2.5 mm diameter, with dense indumentum; colleters 4 at lamina base. Cymes racemiform, up to 90 mm long, held horizontally to pendulous; peduncles 9–10 mm long, 5–6 mm diameter, with dense indumentum; bracts triangular, 1.4–1.5 mm long, 1.2–1.3 mm wide, with sparse to dense indumentum. Flowers 10–15 mm long, 40–45 mm diameter; pedicels 20–50 mm long, 1.1–2.6 mm diameter, with dense indumentum. Sepals lanceolate-ovate, 13–16 mm long, 7–10 mm wide, with dense indumentum externally; colleters 5 large and 5 small (minute) at base of each sinus, each large colleter subulate, 2–3 mm long, 0.7–0.8 mm diameter, with dense indumentum. Corolla campanulate, cream to white; tube 10–14 mm long, 22–25 mm diameter, glabrous; lobes triangular, held horizontally or reflexed, 15–18 mm long, 15–18 mm wide, glabrous. Staminal corona cream to white, 4–5 mm long, 10–16 mm diameter; each lobe 4.8–7.0 mm long, 4.0–4.5 mm high, 2.8–4.0 mm wide at base and c. 0.5 mm wide at upper tip, outer edge rounded and upturned, inner tip lanceolate, not extending beyond style-head. Staminal column 4–7 mm long, 4.6–5.0 mm diameter; anther appendages lanceolate, 1.7–2.0 mm long, 1.3–1.7 mm wide; alar fissure 2.0–2.5 mm long. Style-head depressed-globose, 6.5–7.0 mm long, 4.5–5.0 mm diameter. Ovaries c. 4 mm long and 2 mm diameter, with sparse indumentum. Pollinarium 1.3–1.4 mm long, 1.2–1.3 mm wide; pollinia oblong, 1.12–1.15 mm long, 0.35–0.42 mm wide, with pellucid germination mouth on outer edge; corpusculum ovate, 0.8–0.9 mm long, 0.55–0.58 mm wide; caudicles 0.30–0.35 mm long, 0.13–0.14 mm wide, not winged. Fruit fusiform, c. 190 mm long and 12 mm diameter, glabrous. Seed not seen. **Fig. 1.**

Specimens examined. Papua New Guinea. MOROBE PROVINCE: Moikisung – Manga track, c. 2 km above Moikisung, Huon Peninsula, 6°37'S, 147°38'E, Sep 1976, *Clunie et al.* LAE63319 (BRI, L, LAE); Mapos, Snake River, 6°55'S, 146°45'E, Mar 1971, *Streimann & Kairo* NGF25879 (BRI, CANB, L, LAE); Bulolo – Watut Divide, Rd 46, 9 km SW of Bulolo, 7°15'S, 146°35'E, Dec 1980, *Kairo* 691 (A, L; K n.v.); Wantoat, Feb 1940, *Clemens* 11126 (A, BISH, BRI, L); Patep, Mumeng, Mar 1979, *Rau* 482 (LAE). **Cultivated.** Lae Botanic Gardens (origin not stated), 1957, *Millar* NGF9213 (A, BRI); Arawa Plantation, Bougainville (origin not stated), Apr 1970, *Millar & Vandenberg* NGF48503 (BRI, LAE); Emerald Creek, Mareeba (ex Lukins Rubber Estate near Sogeri, Central Province, USDA354244), Apr 1990, *Liddle* IML76 (BRI).

Distribution and habitat: Known with certainty only from the Morobe and Central Districts of Papua New Guinea (**Map 1**). Plants grow as lianes in lowland rainforests at altitudes of 650 – 2000 m.

Notes: This species has been confused with *H. albiflora* (Zipp. ex Blume) Boerl. in cultivation. It is probably closely related to *H. albiflora* but is immediately distinguishable by the much larger flowers of which the corolla lobes are held horizontally or reflexed at anthesis, as opposed to the smaller flowers with corolla lobes inflexed at anthesis in the latter species.

Etymology: The specific epithet alludes to the magnificent white flowers of this species.

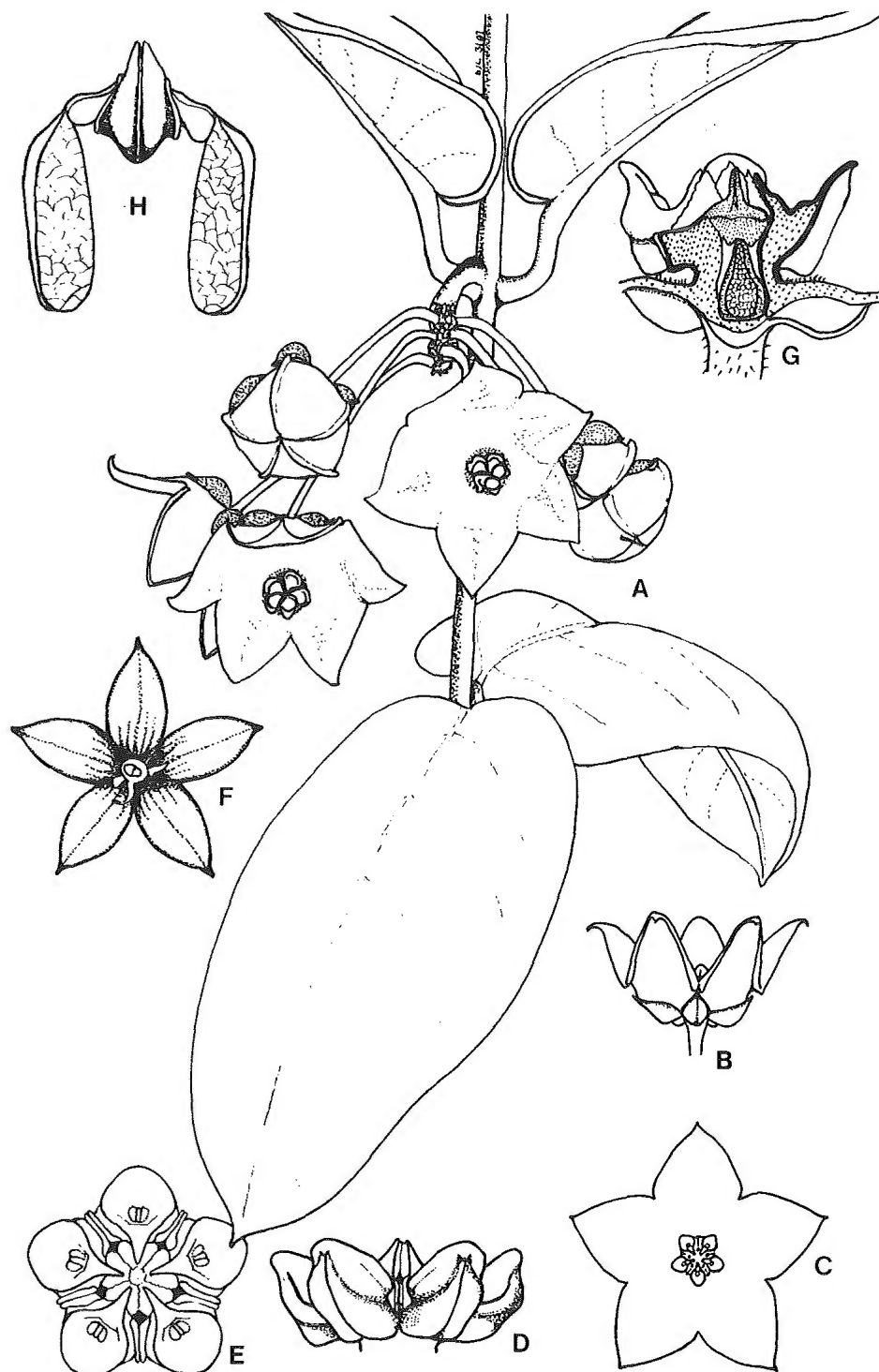


Fig. 1. *Hoya magnifica*: A. habit of flowering stem $\times 0.5$. B. side view of flower $\times 0.5$. C. face view of flower $\times 0.5$. D. side view of staminal column and corona $\times 2.5$. E. face view of staminal column and corona $\times 2.5$. F. face view of calyx $\times 2.5$. G. vertical cross-section of flower $\times 2.5$. H. pollinarium (inverted) $\times 16$. All from Liddle IML76. Del. D.J. Liddle.

2. *Hoya albiflora* (Zipp. ex Blume) Boerl., Handl. Fl. Ned.-Ind. 2(2): 440 (1899); *Pterostelma albiflora* Zipp. ex Blume, Rumphia 4: 33, t. 188 (1849). **Type:** Nov. Guinea [New Guinea], Zipp. [*Zippelius*] (holo: L! [898168-96, 898168-95, 898168-94]).

Blume, Fl. Ned. Bat. 1: 513 (1856).

Liane to several metres long, latex white. Stems cylindrical, up to 6 mm diameter, with sparse indumentum when young, becoming sparse to glabrous with age; internodes up to 180 mm long. Leaves petiolate; lamina elliptic, up to 180 mm long and 90 mm wide; upper surface glabrous, venation obscure; lower surface glabrous, secondary venation of 6-7 veins per side of midrib nearly obscure, tertiary venation obscure; tip acute to shortly acuminate; base cuneate, truncate or cordate; petiole 18-30 mm long, 1.4-3.0 mm wide, glabrous or with scattered indumentum; colleters 4 at lamina base. Cymes racemiform, up to 70 mm long, held pendulously; peduncles 4-6 mm long, 2-3 mm diameter, with scattered to dense indumentum; bracts triangular to lanceolate-ovate, 0.8-1.6 mm long, 0.6-1.0 mm wide, with scattered to dense indumentum. Flowers 15-18 mm long, 20-25 mm diameter; pedicels 25-50 mm long, 1.0-1.6 mm diameter, with scattered to dense indumentum. Sepals lanceolate-ovate, 13-15 mm long, 6-7 mm wide, with sparse to dense indumentum externally; colleters 5 at base of each sinus, each gland subulate, 3-7 mm long, c. 1 mm diameter, with sparse indumentum. Corolla campanulate, cream to white; tube 8-10 mm long, 15-17 mm diameter, glabrous; lobes triangular, inflexed, 7-11 mm long, 5.5-12.0 mm wide, glabrous. Staminal corona cream to white, 4-5 mm long, 7-8 mm diameter; lobes 3-4 mm long, 4.5-5.0 mm high, 2.7-2.8 mm wide at outer edge, c. 0.5 mm at inner tip, outer edge upturned and sharply rounded, inner tip subulate and reflexed from style-head. Staminal column c. 4 mm long, 5.0-5.4 mm diameter; anther appendages lanceolate, obscuring style-head, 1.5-1.8 mm long, 0.9-1.4 mm wide; alar fissure 1.5-2.5 mm long. Style-head depressed-globose, 1.8-2.0 mm diameter. Ovaries 2.6-3.0 mm long, 1.9-2.0 mm diameter, glabrous. Pollinarium 1.15-1.20 mm long, 1.0-1.1 mm wide; pollinia oblong, 1.15-1.20 mm long, 0.44-0.45 mm wide, with pellucid germination mouth on outer edge; corpusculum ovate, 0.80-0.85 mm long, 0.32-0.50 mm wide; caudicles unwinged, 0.35-0.37 mm long, 0.12-0.13 mm wide. Fruits and seeds not seen. **Fig. 2.**

Specimens examined. Papua New Guinea. MOROBE PROVINCE: Patep III, 6°20'S, 146°45'E, Aug 1969, *Millar* NGF40977 (BRI, LAE; K n.v.). **Cultivated.** Emerald Creek, Mareeba (from unknown origin), Apr 1990, *Liddle* IML299 (BRI).

Distribution and habitat: *H. albiflora* is known only from the Morobe Province in Papua New Guinea (**Map 2**) where it grows as a liane in rainforest.

Notes: There are few collections of *H. albiflora*, either in herbaria or in cultivation. While there are several differently numbered clones of *H. albiflora* in cultivation, none have collection data, and all are probably from the same original plant.

3. *Hoya calycina* Schltr., Bot. Jahrb. Syst. 50: 125 (1913). **Type:** Papua New Guinea. MADANG PROVINCE: Kani Geb., Mar 1908, *R. Schlechter* 17510 (holo: B (photo at BRI!)).

[*Hoya albiflora* auct., non (Zipp. ex Blume) Boerl.: Burton, Hoya 11(2): 57-58 (1989)].

Liane to several metres long, latex white. Stems cylindrical, up to 6 mm diameter, glabrous or with scattered to dense indumentum when young, becoming corky with age; internodes up to 160 mm long. Leaves petiolate; lamina elliptic to elliptic-ovate, up to 170 mm long and 90 mm wide; upper surface glabrous or with scattered indumentum, venation obscure; lower surface glabrous or with scattered to dense velutinous indumentum, venation obscure; tip acute, acuminate, or apiculate; base rounded, cuneate, or slightly cordate; petiole 12-30 mm long, 1.5-3.5 mm diameter, with scattered to dense indumentum; colleters 4 at lamina base. Cymes racemiform, up to 70 mm long; peduncles 6-25 mm long, 3-7 mm diameter, glabrous or with scattered to dense indumentum; bracts triangular to lanceolate, 0.8-1.0 mm long, 0.5-1.0 mm wide. Flowers 9-10 mm long, 18-28 mm diameter; pedicels 24-44 mm long, 1.6-2.0 mm diameter, glabrous or with scattered to dense indumentum. Sepals lanceolate to lanceolate-ovate, 2.8-5.0 mm

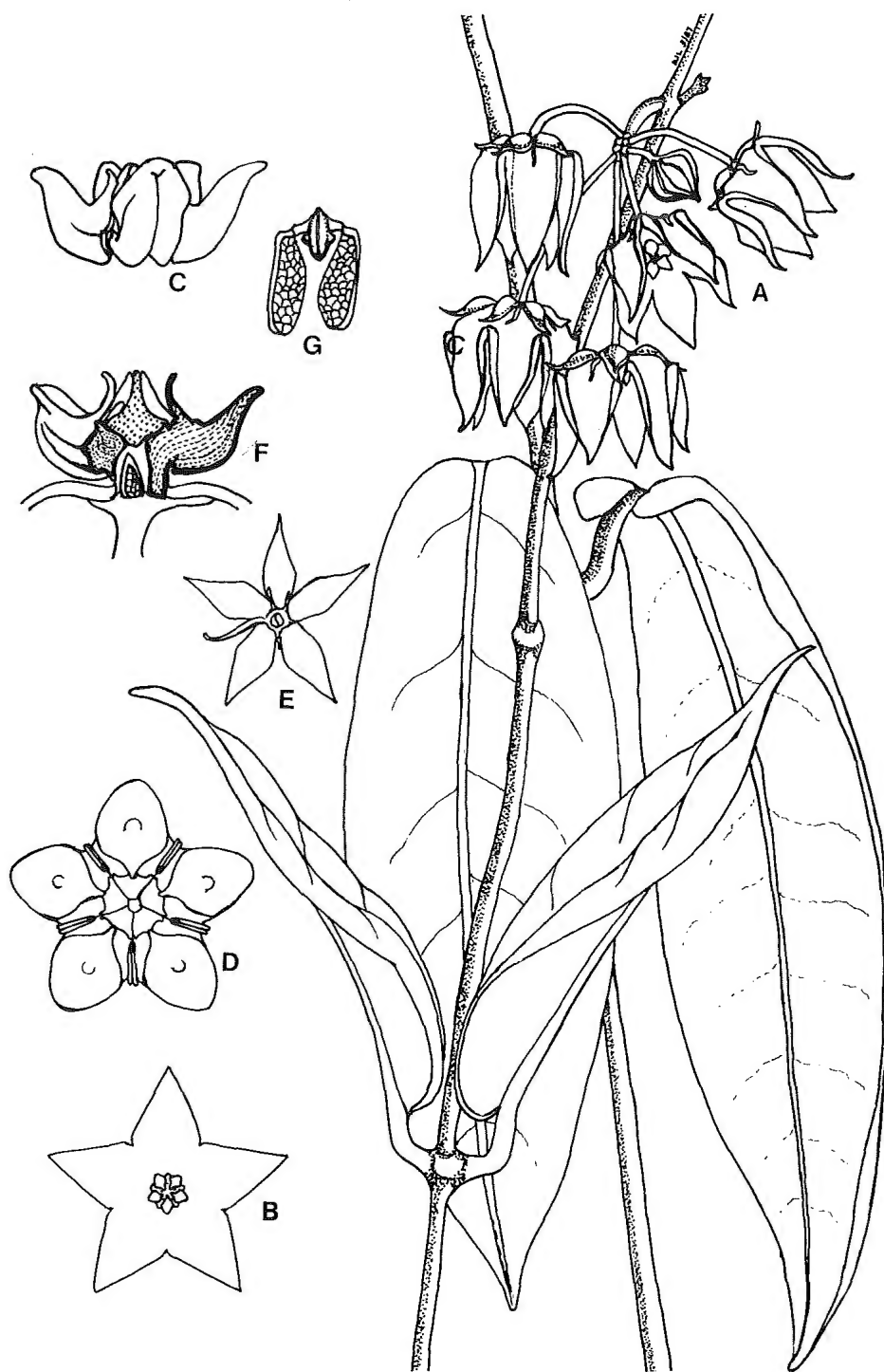


Fig. 2. *Hoya albiflora*: A. habit of flowering stem $\times 0.5$. B. face view of flower $\times 0.5$. C. side view of staminal column and corona $\times 3$. D. face view of staminal column and corona $\times 3$. E. face view of calyx $\times 0.75$. F. vertical cross-section of flower $\times 3$. G. pollinarium (inverted) $\times 8$. All from Liddle IML299. Del. D.J. Liddle.

long, 1.2–3.0 mm wide, glabrous or with scattered to dense indumentum; base of each sinus with an irregular glandular ridge. Corolla campanulate-rotate, cream to white, red to purple under coronal lobes and around gynostegium; tube 3.0–5.4 mm long, 8–14 mm diameter, glabrous; lobes lanceolate-ovate, 7–13 mm long, 4–9 mm wide, glabrous or with scattered to sparse indumentum on the edges and externally. Staminal corona 4.0–4.3 mm long, 7–13 mm diameter; lobes 3.4–4.8 mm long, 4.0–4.3 mm high, 1.8–2.5 mm wide. Staminal column 3.6–4.0 mm long, 2.5–3.5 mm diameter; anther appendages lanceolate, 1.6–2.0 mm long, 1.7–1.8 mm wide; alar fissure 1.3–2.0 mm long. Style-head depressed-globose, 1.5–1.9 mm diameter. Ovaries 2.3–2.4 mm long, 1.8–1.9 mm wide, glabrous. Pollinarium c. 1.1 mm long, 0.85–0.90 mm wide; pollinia oblong, 1.05–1.10 mm long, 0.35–0.40 mm wide, with pellucid germination mouth on outer edge; corpusculum ovate, 0.60–0.65 mm long, 0.35–0.40 mm wide; caudicles unwinged, 0.25–0.30 mm long, 0.06–0.07 mm wide. Fruit and seed not seen. Fig. 3.

Notes: *H. calycina* is a distinctive species that has been confused with *H. australis* and *H. albiflora*, mainly because of its superficially similar flowers. It differs most markedly from *H. australis* in the more-or-less internally glabrous corolla and the much larger staminal corona and from *H. albiflora* in the rotate corolla. Like *H. australis*, *H. calycina* is variable in terms of indumentum and two subspecies can be recognised on this character.

Key to subspecies of *Hoya calycina*

1. Lamina with dense velutinous indumentum below, calyx and corolla with sparse to dense indumentum externally subsp. *calycina*
 Lamina glabrous or with scattered indumentum below, calyx and corolla
 glabrous or with scattered indumentum externally subsp. *glabrifolia*

3a. *Hoya calycina* subsp. *calycina*

Lamina with dense velutinous indumentum below. Calyx and corolla with sparse to dense indumentum externally.

Specimens examined. Papua New Guinea, NEW IRELAND: Wanup near Lossuk, 2°45'S, 151°04'E, Jan 1967, *Coode et al.* NGF29625 (L). MOROBE PROVINCE: S of Boana, 6°30'S, 146°50'E, Feb 1977, *Conn et al.* 86 (K,L); Patep Creek, 6°35'S, 146°25'E, May 1959, *Millar* NGF9967 (A,BRI,CANB,LAE); Zenag, 7°00'S, 146°35'E, Jul 1968, *Millar* NGF12115 (A,BRI,CANB,LAE); Kwaimengu, Aseki Patrol Area, Apr 1966, *Craven & Schodde* 1459 (A,L,LAE). SOUTHERN HIGHLANDS PROVINCE: Mt Bosavi, northern side, N of the Mission Station, 6°26'S, 142°50'E, Oct 1973, *Jacobs* 9496 (L,LAE). NORTHERN PROVINCE: c. 2 km W of Popondetta along road near airstrip, Jul 1953, *Hoogland* 3379 (A,BM,BRI,CANB,K,L,LAE). MILNE BAY PROVINCE: SW of Nowata airstrip, 9°59'S, 149°44'E, Jul 1969, *Kanis* 1104 (CANB,LAE). **Cultivated.** Emerald Creek, Mareba (ex plant collected MOROBE PROVINCE: Patep II Village, [USDA354236]), Apr 1990, *Liddle* IML201 (BRI).

Distribution and habitat: Widespread in Papua New Guinea (Map 3). Plants grow in rainforest at altitudes of 20–1400 m.

- 3b. *Hoya calycina* subsp. *glabrifolia* P. Forster & Liddle **subsp. nov.**, a *H. calycina* Schltr. subsp. *calycina* lamina foliorum glabra vel infra pilis dispersis praedita, calyce corollaeque glabra vel extus pilis non nisi sejunctis praedita differt. **Typus:** Irian Jaya. 4 km SW of Bernhard Camp, Idenburg River, Mar 1939, *L.J. Brass* 13465 (holo: BRI!; iso: A!, BO!, L!).

Lamina glabrous or with scattered indumentum below; calyx and corolla glabrous or with scattered indumentum externally.

Specimens examined. Papua New Guinea, WESTERN HIGHLANDS PROVINCE: Jimmi Valley, near Karap, Jun 1955, *Womersley & Millar* NGF7648 (BRI,LAE). EASTERN HIGHLANDS PROVINCE: Kassam, Nov 1959, *Brass* 32470 (LAE). MOROBE PROVINCE: Bupu Village, Wampit, 6°50'S, 146°55'E, Jul 1967, *Millar* NGF22936 (BRI,L,LAE). CENTRAL PROVINCE: Isuarava, 9°00'S, 147°44'E, Mar 1936, *Carr* 16107 (BM,CANB,L,NY,SING; K n.v.).

Distribution and habitat: Widespread but rarely collected in Papua New Guinea (Map 4). Plants grow as lianes in rainforest at altitudes of 1500–1900 m.

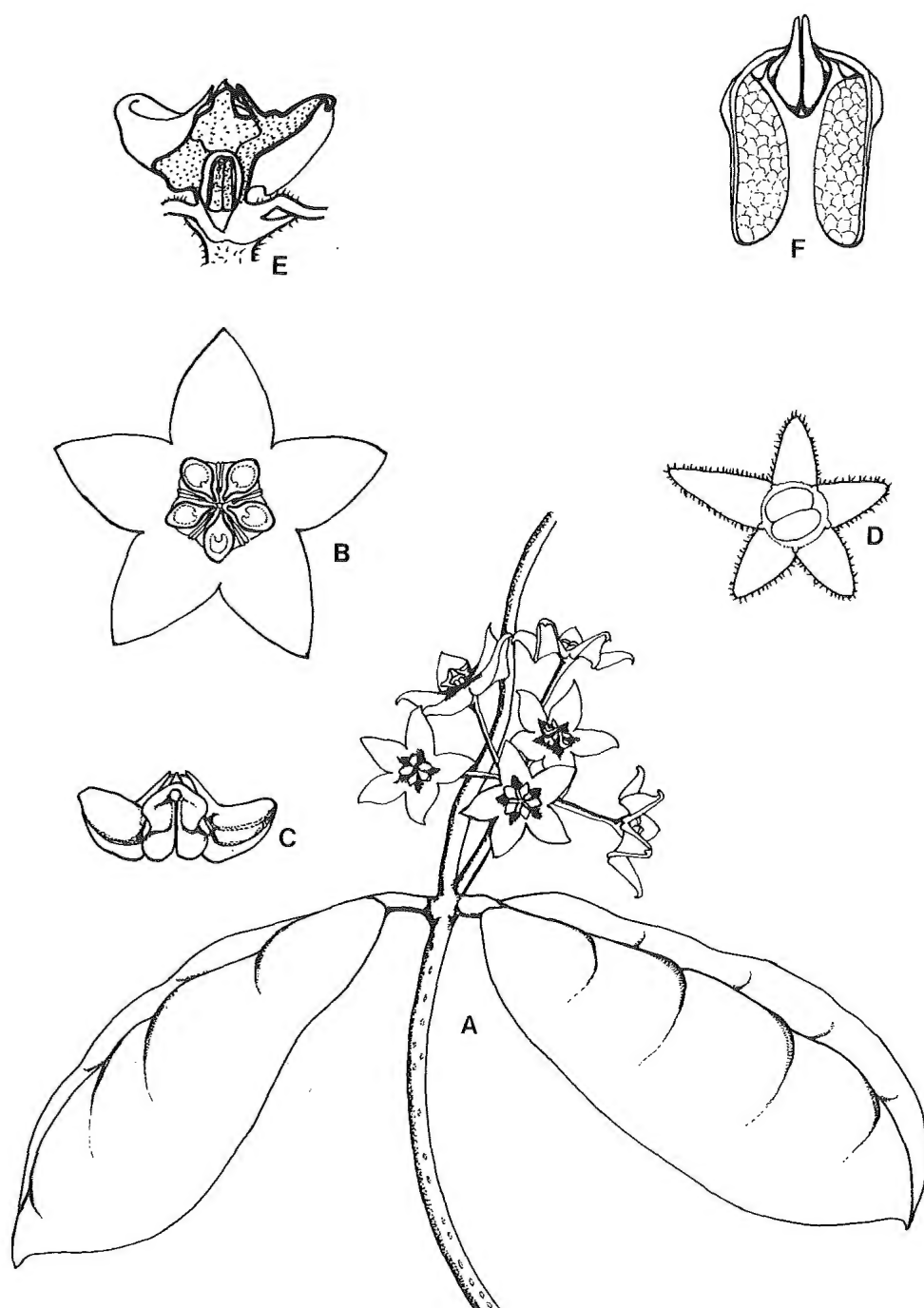


Fig. 3. *Hoya calycina* subsp. *calycina*: A. habit of flowering stem $\times 0.5$. B. face view of flower $\times 12.5$. C. side view of staminal column and corona $\times 3$. D. face view of calyx $\times 3$. E. vertical cross-section of flower $\times 3$. F. pollinarium (inverted) $\times 28$. All from Liddle IML201. Del. D.J. Liddle.

2. Typification and synonymy of *Hoya pottsii* Traill

Hoya pottsii Traill, Trans. Hort. Soc. 7: 25 (1827). **Type:** based on plant in cultivation. (lecto (here designated): Traill, Trans. Hort. Soc. 7: 25. fig 1 (1827)).

Hoya nicholsoniae F. Muell., Fragm. 5: 159 (1866). [October, not specified to day], **synon. nov. Type:** 'In arboribus ad sinum litoreum Rockingham's Bay, *Dallachy*' (holo: MEL *n.v.*).

Hoya hellwigiana Warb. in Fedde, Repert. Spec. Nov. Reg. Veg. 3: 342 (1907). **synon. nov. Type:** 'Kaiser Wilhelms-Land: Bussum bei Finschhafen', *O. Warburg* 21313 (holo: B *n.v.*, destroyed).

Hoya sogerensis S. Moore, J. Bot. 52: 293 (1911). **synon. nov. Type:** Papua New Guinea. CENTRAL PROVINCE: River side Sogere, 1885–6, *H.O. Forbes* 691 (holo: BM!).

Additional selected specimens. Celebes, Sulawesi Selatan, Soroako, S. shore of Lake Matano, *de Vogel* 5793 (BRI). Irian Jaya, Sorong, Roefei River N of the town, Mar 1954, *van Royen* 3007 (L); Mamberamo, Oct 1914, *Feuilletau de Bruyn* 130 (BO, L); Rouffaer River, Aug 1926, *Docters v. Leeuwen* 10122 (BO, L, SING; K *n.v.*); Waigeo Is, Lupintol Village on SW coast of Majalibit Bay, Feb 1955, *van Royen* 5483 (L); Mairipi, near Andai, SW of Manokwari, Nov 1961, *Vink* BW12104 (L). Papua New Guinea, EAST SEPIK PROVINCE: Ramu fluß, *Tappenbeck* 37 (WRSL).

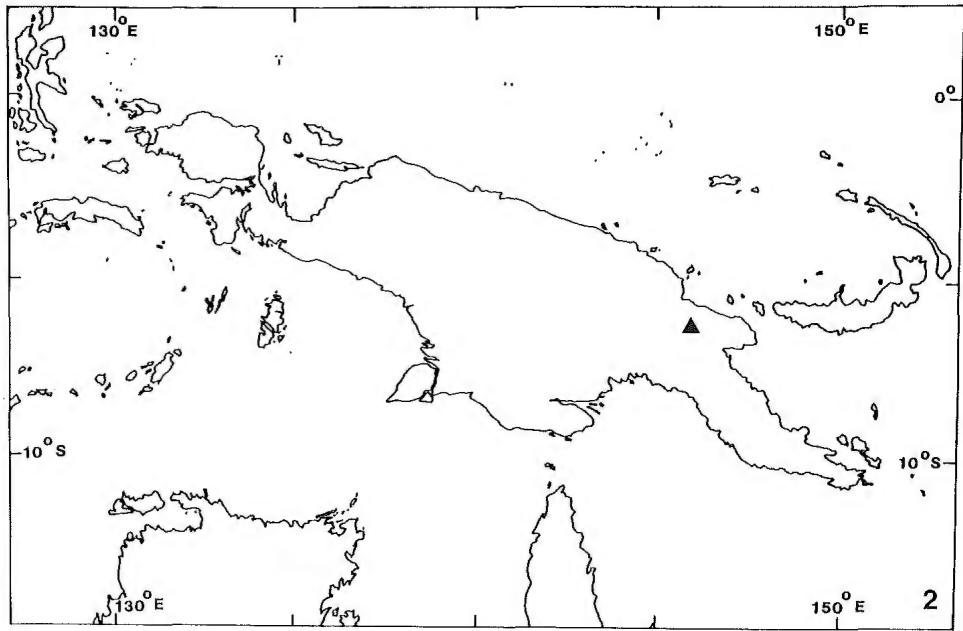
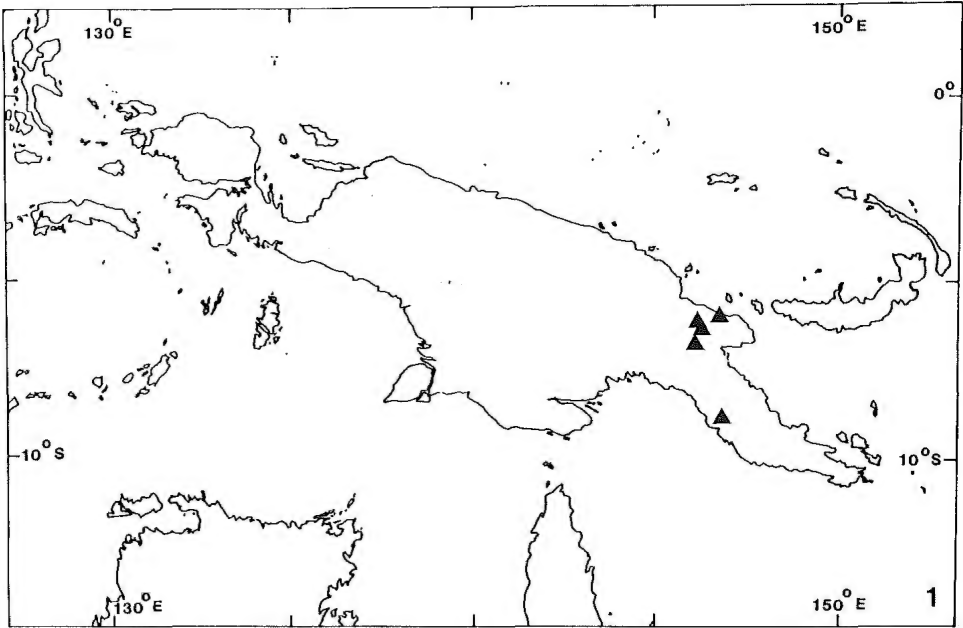
Distribution and habitat: Widely distributed in Celebes, New Guinea and Australia (Forster & Liddle 1990).

Notes: Since the publication of our account of *H. nicholsoniae* F. Muell. (Forster & Liddle 1990), we have been able to examine a much greater range of material, particularly from L, that is referable to this taxon. From this it is clear that *H. nicholsoniae* F. Muell., *H. hellwigiana* Warb. and *H. sogerensis* S. Moore are all conspecific, based on the examination of type collections, original descriptions and collections from the areas where these taxa originated. However, it is evident that *H. pottsii* Traill is also conspecific with these taxa as suggested by Burton (1983) and hence, due to priority, its name is the correct one to be used for the aggregate taxon.

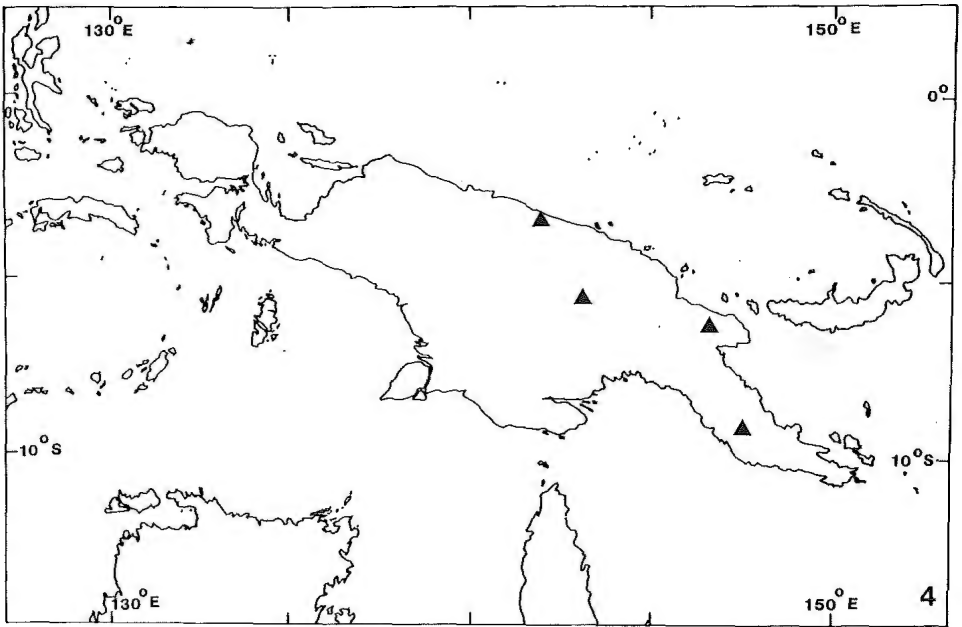
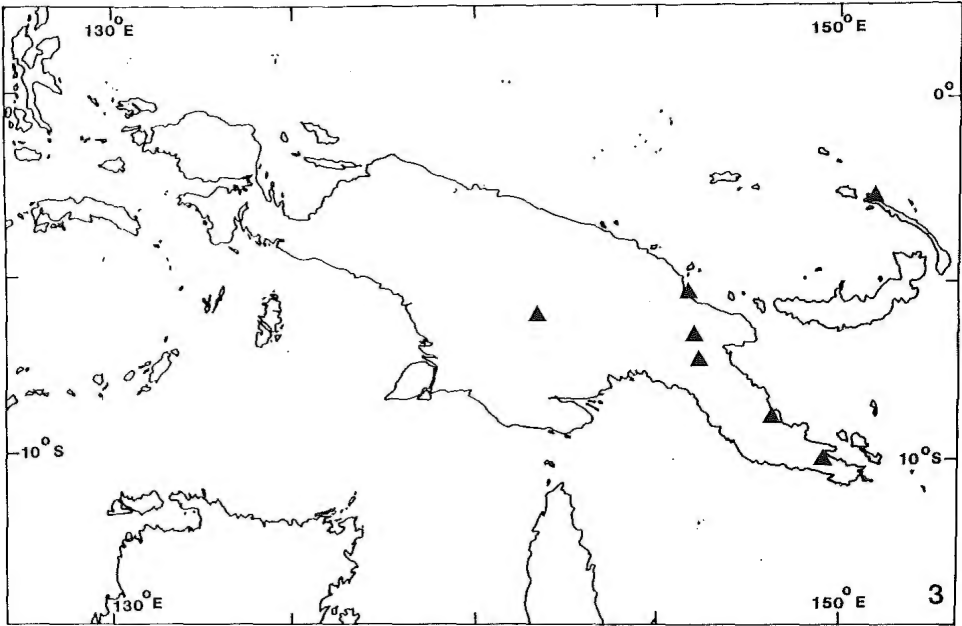
H. pottsii has been newly named in most geographic regions where it has been collected, and although there is wide variation in flower colour and to some extent leaf size and shape, which are both dependent on environment (Forster & Liddle 1990), there are no valid reasons for upholding any of the later names.

The status of *H. samoensis* Seem. described from Samoa, *H. neocaledonica* Schltr. described from New Caledonia, *H. neoebudica* Guill. described from Vanuatu and *H. cominsii* Hemsley, described from Solomon Islands, with respect to *H. pottsii* is unclear at this stage. We have examined a wide range of collections from these areas (holdings at BSIP, P and NOU) and recently collected (June 1991) a range of material from Solomon Islands of *H. cominsii*; however, further comparisons with *H. pottsii* from Australia and New Guinea must wait until this recent material has been grown and flowered under similar conditions.

Typification of *H. pottsii* is critical to the application of the name and this species was named somewhat informally by Traill (1827). There appears to be no specimen at K that could be unequivocally considered as a type for *H. pottsii*. However, there is a flowering specimen at K labelled 'Hoya Pottsii Traill. Hort Glasg. bot. Mag. t. 3425' that may possibly represent the cultivated material illustrated both by Traill and by Hooker (1835). This plant may well have persisted in cultivation at K for a considerable time as there is a further flowering collection of 2 sheets labelled [in part] 'Hoya pottsii Traill native in China . . . EN464-63 Sir George Taylor H2855/86 . . .'. While the geographic origin of both these cultivated collections is problematic, it is unlikely that they came from China [Macao], the reputed origin for *H. pottsii* (Traill 1827; Hooker 1835), and both are conspecific with the Australian and Papuan material. While of dubious status as types of *H. pottsii*, both specimens lend credence to our application of the name *H. pottsii* to the taxa treated as conspecific in this paper. In the absence of an unequivocal type specimen for *H. pottsii*, we have selected as lectotype, the plate published by Traill (1827) which agrees perfectly with the taxon we applied the name to.



Maps 1–2. Distribution of *Hoya* spp. 1. *H. magnifica*. 2. *H. albiflora*.



Maps 3-4. Distribution of *Hoya calycina*. 3. *H. calycina* subsp. *calycina*. 4. *H. calycina* subsp. *glabrifolia*.

No type material of *H. hellwigiana* Warb. has been located; however, we have found the collection *Tappenbeck* 37 that was cited by Schlechter (1913) in his account of this species. Given that Schlechter would have surely seen the type of *H. hellwigiana*, it seems reasonable to allocate this name to synonymy based on this collection and the original description.

3. Typification and synonymy of *Hoya anulata* Schltr.

Hoya anulata Schltr. in Schumann & Lauterb., Nachträge Fl. Schutzgeb. Südsee 362 (1905). **Type:** Papua New Guinea. MADANG PROVINCE: Auf Bäumen am oberen Nuru, auf dem Wege vom Ramu zur Küste, 4 February 1902, *R. Schlechter* 14185 (holo: B!).

Schltr., Bot. Jahrb. Syst. 50: 118 (1913).

Hoya schlechteriana S. Moore, Trans. Linn. Soc. 9: 112 (1916), **synon. nov.** **Type:** Irian Jaya. Camps III–VI, 1912–13, Utaqua River to Mt Carstensz, *C.B. Kloss* (holo: BM!).

Hoya poolei C. White & Francis, Proc. Roy. Soc. Queensl. 39: 69, fig. 13 (1928), **synon. nov.** **Type:** Papua New Guinea. MADANG PROVINCE: Joangey, South eastern end of Finnisterre Range, December 1923, *C.E. Lane-Poole* 566 (holo: BRI!; iso: K!).

Hoya pseudolittoralis Norman, Brittonia 2: 328 (1937), **synon. nov.** **Type:** Papua New Guinea. WESTERN PROVINCE: Dagwa, Oriomo River, Feb–March 1934, *L.J. Brass* 5990 (holo: NY *n.v.*; iso: A!, BM (photo at BRI!), BO!, BRI!).

Hoya alata K. Hill, Telopea 3: 249 (1988), **synon. nov.** **Type:** Australia, Queensland. COOK DISTRICT: Pascoe River rockpile, *B. Wallace* 83250 (holo: NSW, *n.v.*).

Hoya sp., Jones & Gray, Austral. Climbing Pl. Fig. 126 (1977).

[*Hoya gracilipes* auct. non Schltr.: Jones & Gray, Climbing Pl. Austral. 242 (1988)].

Forster & Liddle, Austrobaileya 3: 228–230 (1990).

Additional specimens examined. Irian Jaya, Orob River, Feb 1913, *Pulle* 1202 (BO, L.). Papua New Guinea. WESTERN HIGHLANDS PROVINCE: Baiyer River, Nov 1954, *Womersley & Floyd* NGF6809 (LAE). MOROBE PROVINCE: 4 miles [6.7 km] NE of Boana, near Guambot, 6°30'S, 146°50'E, Mar 1977, *Conn et al.* 70 (CANB, K, LAE); Boana, Jul 1938, *Clemens* 8480 (A, B, L); ditto, May–Nov 1940, *Clemens* 41725 (A, BRI); Bupu Village above Wampit River, Mar 1964, *Millar* NGF23296 (A, BRI, CANB, L, LAE); Ekwap, Wantoat, Aug 1968, *Millar* NGF12130 (L, LAE); Wantoat, Jun 1957, *White* NGF9523 (LAE); Patep, Mar 1959, *Millar* NGF9904 (BRI); Wareo, Jan 1936, *Clemens* 1521 (A); Finnisterre Range, Ekwap, near Wantoat, Aug 1968, *Philipson* 3305 (A, L); Zenag, 7°00'S, 146°35'E, May 1969, *Millar* NGF40862 (LAE). GULF PROVINCE: near Iori Village, Ihu, Apr 1971, *Stone* 10143 (L, LAE). Australia, Queensland. COOK DISTRICT: Garraway Creek rockpiles, Apr 1988, *Forster* 4234 & *Liddle* (BRI); South Pap, Tozers Gap, Jul 1991, *Forster* 9079 (BRI).

Notes: Examination of the type specimen of *H. anulata* Schltr. has found it to be conspecific with *H. pseudolittoralis* Norman (Forster & Liddle 1990). *H. anulata* is widely distributed in New Guinea, but has only been found in the Tozer Range area of Queensland.

Of importance with respect to the synonymy for this taxon, is *H. poolei* C. White & Francis which was applied by Liddle (1986) to the Australian material. Both the BRI holotype and the K isotype of *H. poolei* lack flowers; however, the foliage is a good match for those of *H. anulata* (based on the range of specimens examined) and the flowers figured by White and Francis (1928) agree with those of this taxon.

Isotype specimens of *H. alata* K. Hill have yet to be examined, despite repeated requests to NSW for their distribution.

4. Typification and synonymy of *Hoya revoluta* Wight ex J.D. Hook.

Hoya revoluta Wight ex J.D. Hook., Fl. Brit. India 4: 55 (1883). **Type:** Malaysia. Malacca, 10 November 1867, *A.C. Maingay* 1127 (lecto: K!, *fide* Rintz, Malay. Nat. J. 30: 486 (1978)).

Hoya inconspicua Hemsley, Bull. Misc. Inform. Kew 1894: 213 (1894), **synon. nov.** **Type:** Solomon Islands, *Officers of H.M.S. Penguin* (holo: K!).

Hoya litoralis Schltr. in Schumann & Lauterb., Nachträge Fl. Schutzgeb. Südsee 363 (1905), **synon. nov.** **Type:** Papua New Guinea. MADANG PROVINCE: Auf Baumen am Strande von Potsdam Hafen, 16 October 1901, *R. Schlechter* 13675 (holo: B (photo at BRI!)).

Forster & Liddle, *Austrobaileya* 3: 228–229 (1990).

Hoya dodecatheiflora Fosb., *Lloydia* 3: 118 (1940), **synon. nov.** **Type:** Solomon Islands. TEMOTU PROVINCE: Santa Cruz Islands, Vanikoro, Tevia Bay, 6 May 1933, *Stewart* (holo: BISH *n.v.*).

Additional selected specimens. Malaysia. JOHORE: between G. Blumut & G. Bechua, May 1923, *Holtum* 10844 (K); Bukit Paloh Estate, Apr 1958, *Shah & Kadim* 390 (K,L); Kg. Hubang Development Area, 100 m. s. Endau Road, Jul 1959, *Burkill* 1904 (L). SELANGOR: Sg. Buloh, R.R.I.E.E. Forest Reserve, Nov 1956, *Burkill & Shah* 1066 (K,L). Indonesia. Sumatera. Vicinity of Aek Mocute (Aer Moette) Asahan, NE of Tomoean Dolok & W of Salabat, Jul 1936, *Boeea* 9335 (L); Mt Sago near Pajakumbuh, Jun 1956, *Meijer* 5099 (L). Borneo. Central Kutei, Belajan R., near Kembang Djangut, May 1955, *Kostermans* 10692 (L); West Kutei, Mt Palimasan near Tabang on Belajan River, Sep 1956, *Kostermans* 12751 (L). Irian Jaya. East bank of Merauke River, S of Senajo, Aug 1954, *van Royen* 4668 (A,CANB,L); Merauke River, West bank between Djedjoerah & Eramboe, Aug 1954, *van Royen* 4812 (CANB,L). Papua New Guinea. WEST NEW BRITAIN: Nantambu, Feb 1971, *Lelean & Stevens* LAE51180 (L,LAE). WESTERN PROVINCE: c. 8 miles [13 km] S of Morehead Patrol Post, Trans-Fly area, Aug 1967, *Paijmans* 291 (CANB); Weam, Jul 1967, *Ridsdale* NGF33505 (BO,CANB,L,LAE; K *n.v.*). Solomon Islands. GUADALCANAL PROVINCE: Mt Austen area, Jun 1991, *Forster* 8608, 8612 & *Liddle* (BRI); NW of Tinomeat Village, Goldridge area, Jun 1991, *Forster* 8722 & *Liddle* (BRI,K); NW Guadalcanal, Mataniko'o River, Nov 1967, *Nakisi et al.* BSIP8246 (BSIP,K,L). MALAITA PROVINCE: Malaita, Are-are dist., Moka village, Nov 1965, *Hunt* 3080 (K). MAKIRA PROVINCE: San Cristobal, Kira Kira, Aug 1932, *Brass* 2761 (A,L). TEMOTU PROVINCE: Santa Cruz Group, Vanikoro Island, Dec 1928, *Kajewski* (K); Luendambu area, Tomotu Noi, Apr 1972, *Powell* BSIP19500 (BISH,BSIP,CANB,L).

Notes: Like *H. pottsii*, *H. revoluta* has a very wide geographic distribution from Malaysia (Rintz 1978), through Malesia to New Guinea, Solomon Islands and northern Queensland. Once again, this species has been formally renamed in various geographic regions of its occurrence, e.g. *H. inconspicua* Hemsley (Hemsley 1894) and *H. dodecatheiflora* Fosb. (Fosberg 1940) from Solomon Islands and *H. litoralis* Schltr. from New Guinea (Schlechter 1905). The type of *H. inconspicua* is notable for its very long leaves and the type of *H. dodecatheiflora*, as illustrated by Fosberg (1940), for a more raised style-head in relation to the anthers than is typical in *H. revoluta* from Malesia. Examination of many flowering plants in Solomon Islands shows that there are plants with both long and short leaves. Hence this character is unreliable for species distinction. Some plants have raised style-heads whereas others did not. However, there are numerous intermediates and this character is also unreliable for distinguishing species. Hence there is no justification for recognition of these taxa at specific rank distinct from *H. revoluta* s. lat. However, further fieldwork and cultivation under uniform conditions of plants of known origin from throughout the range of *H. revoluta*, may well produce data that justifies an infraspecific taxonomy based on vegetative characters, similar to that proposed for *H. australis* (Forster & Liddle 1991).

H. revoluta appears to be a commonly collected species that occurs in lowland riverine and coastal situations throughout its geographic range.

5. Typification and synonymy of *Hoya sussuela* (Roxb.) Merr.

Hoya sussuela (Roxb.) Merr., Interpret. Rumph. Herb. Amboinense 438 (1917); *Asclepias sussuela* Roxb., Fl. Ind. ed. 2, 2: 31 (1832). **Type:** Rumph., Herb. Amboinense 5: t. 172 (1750).

Hoya corona ariadnes Blume, Rumphia 4: 31 (1849). **Type:** Rumphia 4: t. 182, 185 (lecto: *fide* Merrill, Interpret. Rumph. Herb. Amboinense 439 (1917)).

Hoya speciosa Decne. in DC., Prodr. 8: 634 (1844). **Type:** Amboina, La Billardiére (holo: ?P *n.v.*, *fide* Merrill, Interpret. Rumph. Herb. Amboinense 439 (1917)).

Hoya ariadna Decne. in DC., Prodr. 8: 635 (1844). **Type:** Rumph., Herb. Amb. 5: t. 172 (1750) (lecto: *fide* Merrill, Interpret. Rumph. Herb. Amboinense 439 (1917)).

Hoya coronaria var. *papuana* Bailey, Queensl. Agric. J. 3: 156 (1898), **synon. nov.** **Type:** Papua New Guinea: Foot of Mt Trafalgar, *F.M. Bailey* (holo: BRI [AQ360787!]).

Hoya hollrungii Warb., Feddes Repert. Spec. Nov. Regni. Veg. 3: 342 (1907), **synon. nov.** **Type:** Papua New Guinea. WEST SEPIK PROVINCE: Augusta Station, 1887, *M. Hollrung* (holo: B†; iso: MEL 1520112!; K *n.v.*).

Hoya sp., Liddle, *Hoya* in Australia 26, 28–33 (1986); Jones & Gray, *Climbing Pl. Austral.* 237, 252 (1988).

[*Hoya rubida* auct. non Schltr.: Jones & Gray, *Austral. Climbing Pl.* 126–127 (1977)].

[*Hoya lauterbachii* auct. non Schumann: P. Forster & Liddle, *Austrobaileya* 3: 220 (1990)]

Additional specimens examined. **Malesia.** Amboina, Jul–Nov 1913, *Robinson* 90 (L; K *n.v.*); South Celebes, Danau Towuti, Timampu, Nuha, Luwu, Apr 1984, *Ramlanto* 168 (L; K *n.v.*).

Notes: *H. sussuela* has had a chequered taxonomic history; however, the analysis of Merrill (1917) is relatively unambiguous and his synonymy is followed here. Paramount to the identification of the common taxon that occurs in far northern Queensland and New Guinea now recognised as *H. sussuela*, is the interpretation of plates, 182 and 185 of Blume (1848) and 172 of Rumphius (1750), all of which are based on plants from the Moluccas to the west of Irian Jaya. Table 172 of Rumphius is not particularly helpful, apart from depicting a plant of section *Eriostemma* Schltr. Blume's Table 182, by comparison, is well executed and the plant depicted is conspecific with this taxon common in New Guinea and Australia. Blume's Table 185 depicts only fruit and seed. C.B. Robinson in 1913, attempted to recollect those taxa depicted by Rumphius (Merrill 1917), and his collection No. 90 from Amboina is conspecific both with the plants illustrated in Blume's plates cited and the taxon common in New Guinea and Australia.

The original type citation for *H. hollrungii* requires the collection *Hollrung* 661. The K sheet, which we have not seen, has this number, and although the MEL sheet does not have this number, in all other respects the label data is in agreement with the original citation, and the specimen agrees with the original description. Also we have located the specimen *Schlechter* 14297 (WRSL) which was cited by Schlechter (1905) in his account of *H. hollrungii* and this is conspecific with the taxon delimited here.

In retrospect, we believe that the name *H. lauterbachii* Schumann has been misapplied both to *H. sussuela* in Australia and New Guinea and *H. gigas* Schltr. from New Guinea (Forster & Liddle 1990). The plate of *H. lauterbachii* in Schumann (1905) depicts a plant with more flattened campanulate corollas, long thin pedicels and a sharper angled staminal corona than the plants under consideration here. *H. gigas* has markedly larger flowers (50–70 mm diameter) with more widely spaced coronal lobes. As yet we have not seen either herbarium or live material that quite matches Schumann's plant and its identity remains uncertain.

We still have not found any authentic type material of *H. neoguineensis* Engler, which as mentioned previously (Forster & Liddle 1990), may also be referable here. In the absence of such material this name should still be regarded as of uncertain application. As outlined previously, *H. sussuela* is very variable in flower size and colour (Forster & Liddle 1990), and in the herbaria cited, collections of this taxon account for nearly one third of all the holdings of *Hoya* material.

Acknowledgements

B. Leuenberger (B) provided a listing of extant *Hoya* types at B and answered various queries on the existence of specimens. The Directors/Managers of the herbaria A, B, BO, BM, BRI, BSIP, CANB, K, L, LAE, MEL, MICH, NOU, NY, P, US and WRSL allowed access to collections either at their institutions or on loan. The latin diagnoses were translated by L. Pedley. G. Leach (DNA) while Australian Botanical Liaison Officer at Kew, U.K., located and photographed various specimens in K and BM. G. Dennis, Honiara, gave freely of his field knowledge of *Hoya* in Solomon Islands. Some spirited discussions on various aspects of this work were held with *Hoya* devotees Ted Green of Hawaii and Chris Burton of Atlanta, Georgia, U.S.A. An anonymous referee kindly drew our attention to duplicates of various collections held at K. The Australian Biological Resources Study provided funding to P.I. Forster during 1988–1990. We gratefully acknowledge this assistance.

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THE GENUS *LEPTOSPERMUM* FORST. ET FORST. F. (MYRTACEAE) IN NORTHERN AUSTRALIA AND MALESIA

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Summary

An annotated list of the 31 *Leptospermum* species accepted for northern Australia and Malesia is provided. *L. madidum* A. Bean replaces the illegitimate name *L. longifolium* (C. White & Francis) S.T. Blake. Two new species, *L. pallidum* and *L. venustum*, and one new subspecies, *L. madidum* subsp. *sativum*, are described. *L. amboinense* Blume is reinstated at species level, and *L. petersonii* subsp. *lanceolatum* J. Thompson is synonymised with it. A multi-access key and a dichotomous key to the 31 species are provided. Significant distributional data additional to Thompson's revision are given.

Introduction

Leptospermum is characterised within the family Myrtaceae by its flowers with a single whorl of free stamens which are shorter than the petals, its versatile anthers, capsular fruits and alternate leaves.

A revision of the genus *Leptospermum* was recently published by Joy Thompson (Thompson 1989), which elucidated many matters of concern to taxonomists and provided a basis for further research. Readers are referred to that publication for descriptions and full synonymy of species not treated in this paper.

The purpose of this paper is twofold: (a) to describe two new species from Queensland, and one new subspecies from Northern Territory and Western Australia, and (b) to deal with taxonomic problems which remain in two northern Australian and Malesian species groups, i.e. the informal *L. brachyandrum* and *L. petersonii* subgroups of Thompson (1989), in particular the circumscriptions of *L. parviflorum* Valetton and *L. javanicum* Blume.

L. parviflorum sensu Thompson and *L. javanicum sensu* Thompson are heterogeneous. Thompson's concept of *L. parviflorum* includes all rheophytic *Leptospermum* species from New Guinea and far northern Australia. However, typical *L. parviflorum* from New Guinea is quite different from the Australian taxon. *L. parviflorum* s. str. has leaves which are dark green above, densely pubescent below, with strongly recurved margins on dried material; the floral hypanthia are densely pubescent, and stem flanges are present and conspicuous. The Australian material has leaves which are pale green, concolourous, glabrous to sparsely pubescent, margins not recurved, floral hypanthia sparsely pubescent, and stem flanges absent. This taxon has been known as *L. longifolium* (C. White & Francis) S.T. Blake but that name is illegitimate and is replaced here by *L. madidum* A. Bean. Populations of *L. madidum* from Northern Territory and Western Australia have much narrower leaves and smaller fruits than those on other populations and have been separated as a subspecies, *L. madidum* subsp. *sativum* A. Bean.

Thompson has applied the name *L. javanicum* to all woody-fruited Malesian *Leptospermum* species except the Mt Kinabalu population of *L. recurvum* Hook. The type of *L. javanicum* has broad obovate discolourous leaves, pubescent floral hypanthia and fruits measuring 4–5 × 6–7 mm. While many specimens do match this description, it is clear that many presently identified as *L. javanicum* do not, and that they represent a distinct taxon, differing clearly from *L. javanicum* by its narrower lanceolate leaves (concolourous or nearly so), mostly glabrous floral hypanthia and fruits measuring 3–4 × 4.0–5.5 mm. The type of *L. amboinense* Blume belongs in this taxon so that name is reinstated here for it.

L. amboinense is widespread in Malesia, even more so than *L. javanicum*, and also extends to north Queensland. While these two species are clearly in the same

subgroup, *L. amboinense* is most closely related to *L. petersonii* Bailey and is identical with *L. petersonii* subsp. *lanceolatum* J. Thompson. In view of the altered circumscription of *L. javanicum* and *L. parviflorum* accepted here, these species are described fully in the text, as are the reinstated species *L. amboinense* and *L. madidum*.

In the annotated species list provided, species are arranged in natural order as perceived by the present author. This is similar to a subset of that used by Thompson (1989), particularly in the placement of major groups. However I have changed the position of some species. For example, *L. lamellatum* is placed next to *L. trinervium* on the basis of its brown, papery bark and seeds with small lateral wings. *L. liversidgei* is removed from the *L. petersonii* subgroup because it appears to have little in common with that group; for example, it lacks stem flanges, its sepals possess very few hairs, and the bark is grey and scaly. In contrast, the species in the *L. petersonii* subgroup have prominent stem flanges, their sepals possess hairs on the margins and apex, and the bark is brown and fibrous.

For the purposes of this paper, northern Australia is defined as including Queensland, Northern Territory and that part of Western Australia which lies north of the 26th parallel. Malesia is the area defined for the Flora Malesiana project (van Steenis-Kruseman 1950), and includes the Malay peninsula, Sumatra, Borneo, Java, Philippines, Sulawesi, Moluccas and New Guinea. The genus *Leptospermum* does extend slightly beyond Malesia into southern Burma (Corner 1940).

Diagnostic Attributes

Two characters useful in the identification of *Leptospermum* species, the presence/absence of stem flanges and seed morphology, are worthy of brief review.

Stem flanges

One of the most diagnostic of vegetative characters in *Leptospermum* is the presence or absence of stem flanges. This term was introduced by Thompson (1989) and refers to the raised ridges of tissue on the branchlets of many *Leptospermum* species, extending from the base of each leaf (Fig 1A.). Stem flanges had been noted previously, as 'angular' or 'triangular' twigs for *L. javanicum* (Corner 1940; Backer & Bakhuizen Van Den Brink 1963; van Steenis 1972), and for *L. wooroonooran* (Bailey 1900). Stem flanges are consistently either present or absent for a given species, and when present they are readily visible with a hand lens. In *L. sericatum*, the flanges are present but poorly developed. Stem flanges are not confined to the genus *Leptospermum*. Of the genera in the *Leptospermum* suballiance of Briggs and Johnson (1979), stem flanges are present in *Homalospermum* and *Pericalymma* (both monotypic genera), they are consistently absent in *Neofabricia* and *Asteromyrtus*, while in *Agonis* and *Kunzea* stem flanges are present in some species but not others e.g. they are prominent in *Kunzea graniticola* Byrnes but absent in *K. opposita* F. Muell.

Seed morphology

The seeds of most of the northern *Leptospermum* species have been examined in the present study. In most cases, seeds were collected from plants in their natural habitat, rather than from herbarium specimens. Thus, seed maturity could be properly assessed. *Leptospermum* species can be placed into two broad groups according to the characteristic of their seeds. 1. Fertile and infertile seeds are identical in appearance, being linear and striate. Germination tests have revealed that each seedlot comprises a mixture of fertile seeds and unfertilised 'chaff'. In this group are all the 'woody-fruited' species e.g. *L. polygalifolium*, and also *L. pallidum*. 2. Seeds and chaff are usually readily distinguishable, the seeds being obovoid to cuneate with a reticulate surface, and the chaff narrower and paler. This group comprises the 'soft-fruited' species, and the seed characters are heterogeneous. Seeds of *L. venustum* and *L. semibaccatum* are dark brown, conspicuously reticulate, and only twice as long as wide. *L. microcarpum* seeds are quite black, while seeds of *L. trinervium* have rows of extended cells forming small lateral wings.

The Species

1. *Leptospermum pallidum* A. Bean **sp. nov.** affinis *L. madido* A. Bean a quo cortice aspera, pedicellis longioribus, fructibus majoribus 5-valvibus, seminibus linearibus, habitatione in summis collium differt. **Typus:** Marble Creek mesa, SE of Greenvale, 19°07'S, 145°04'E, 20 April 1991, A.R. Bean 2949 (holo: BRI; iso: CANB,K, MEL,NSW).

Spreading shrub to 3 metres high; bark rough, grey, longitudinally fissured, closely adhering, persistent throughout; branchlets virtually glabrous, stem flanges absent. Leaves alternate, sessile or with petioles up to 2 mm long, concolourous, pale yellowish-green, narrow-lanceolate, 35–52 × 5–9 mm, more or less triplinerved, oil glands numerous, conspicuous; leaf base cuneate, apex acute to acuminate; young leaves with sparse long hairs on underside, glabrescent. Inflorescence comprising bracteolate monads on condensed axillary shoots, 2–3 flowers on each shoot, often appearing to arise directly from leaf axils; floral bracts and bracteoles shed in early stages of bud development. Flowers 10–15 mm in diameter; pedicels 9–12 mm long, with bracteole scar approximately midway along pedicel; hypanthium glabrous, 1.5–2.0 mm long; sepals obtuse, glabrous, oil dots conspicuous; petals white, orbicular, 3–5 mm long; stamens shorter than petals, 30–40 in a single whorl; anthers versatile, cells parallel, opening by narrow slits; gland conspicuous, globular; style inset, stigma broad, capitate; roof of ovary glabrous, ovary 5-locular. Fruits dry, conspicuously domed above hemispherical base, 5-locular, 4.5–5.0 × 5–6 mm, sepals persistent. Seeds and chaff identical, pale brown, linear, striate, 2.0–2.5 mm long, 0.2 mm wide. **Fig 1.**

Specimens examined: Queensland. BURKE DISTRICT: Porcupine Gorge, Apr 1988, *Fell* DF796 (BRI). NORTH KENNEDY DISTRICT: 20 km east of Greenvale, May 1989, *Fell* DF1809, DF1810 (BRI); beside Charters Towers-Greenvale road, 32.3 km from Greenvale, Jun 1989, *Bean* 1068 (BRI); Marble Creek mesa, SE of Greenvale, Apr 1991, *Bean* 2942 (BRI,DNA,MEL,NSW).

Distribution and habitat: *L. pallidum* has a restricted distribution in northern Queensland, mostly in the Greenvale area, but also at Porcupine Gorge, north of Hughenden. It occurs on lateritic ridges, often on cliff edges with skeletal soil. It sometimes grows near vine-thicket communities on rocky slopes. Associated species include *Eucalyptus exserta* F. Muell., *E. similis* Maiden, *E. persistens* L. Johnson & K. Hill, *E. lamprophylla* Brooker & A. Bean, *Myrtella microphylla* (Benth.) A.J. Scott and *Triodia* sp.

Flowering period: March – June.

Affinities: *Leptospermum pallidum* shows some resemblance to species in the genus *Neofabricia* J. Thompson by virtue of its rough grey bark, large leaves and domed fruits. However, *L. pallidum* lacks all of the most diagnostic characters of *Neofabricia*, which are the very numerous stamens in several irregular whorls, the dorsifixed anthers and the winged seeds (Thompson 1983). Hence it clearly belongs in *Leptospermum* but it has no very close relatives there. It is probably closest to *L. madidum* but differs from that species by its rough bark, longer pedicels, larger 5-valved fruits, linear seeds and ridgetop habitat.

Conservation status: Suggested status is 3RC, as defined by Briggs and Leigh (1988).

Etymology: Named for the pale colour of the leaves.

2. *Leptospermum madidum* A. Bean, **nom. nov.**

Agonis longifolia C. White & Francis, Bot. Bull. Dept. Agr. & Stock, Queensland 22: 18 (1920). **Type:** Endeavour River, ?*Persieh* (holo: BRI, iso: NSW).

Leptospermum longifolium (C. White & Francis) S.T. Blake, Proc. Roy. Soc. Queensland 69: 81 (1958), **nom. illeg.**; non *L. longifolium* Cunn. in Heward, R., Hooker's Journal of Botany 4: 243 (1841).

Shrub or tree to 8 m high, ultimate branches pendulous; bark smooth and deciduous throughout, white, creamy or pink; branchlets sparsely pubescent, glabrescent, stem flanges absent. Leaves alternate, sessile, concolourous, pale green, linear, 22–70 × 1–9 mm, apex acute or acuminate; appressed indumentum present on young leaves, but older leaves generally glabrous. Inflorescence axillary, consisting of several bracteolate

monads; floral bracts shed before anthesis. Flowers 5–7 mm in diameter; pedicels 1 mm long, hypanthium sparsely pubescent, 2–3 mm long; sepals obtuse, margins ciliate; petals white; anthers versatile, cells parallel; style inset, stigma capitate; roof of ovary mostly glabrous but with hairs at base of style and along valve margins; ovary 3-locular. Fruit thin-walled, glabrous, hemispherical, 3-locular, 2–3 × 2.5–5.0 mm, sepals persistent. Seeds light brown, obovoid to elliptical, reticulate, c. 0.75 × 0.3 mm; unfertilised seeds linear to narrowly cuneate.

Flowering period: July – October.

Affinities: *L. madidum* (as *L. longifolium*) was included within *L. parviflorum* Valetton by Thompson (1989). However, *L. madidum* can be readily distinguished from that species by the lack of stem flanges, pale concolourous leaves which are glabrous or only sparsely pubescent, leaves not recurved when dried, the glabrous or sparsely pubescent floral hypanthium and the larger fruits.

Two subspecies are recognisable as follows:

1. Leaves 4.5–9.0 mm wide; fruits 3.5–5.0 mm in diameter subsp. **madidum**
 Leaves 1.0–4.5 mm wide; fruits 2.0–3.5 mm in diameter subsp. **sativum**

L. madidum* subsp. *madidum

Leaves linear to narrow-lanceolate, 38–70 × 4.5–9.0 mm, pale green. Fruits glabrous, hemispherical, 2.5–3.0 × 3.5–5.0 mm.

Selected specimens: Queensland. COOK DISTRICT: bank of Jardine River, Oct 1979, *Scarth-Johnson* 893A (BRI); north bank of Olive River, near mouth, Sep 1974, *Tracey* 14495 (BRI); 60 km west of Strathmay on Musgrave to Edward River road, Oct 1980, *Clarkson* 3498 (BRI,CANB,DNA,K,L,MO,NSW,PERTH,QRS); 10 km SE of Edward River Settlement, Oct 1983, *Garnett* ER497 (JCT); Archer River, beside main Cape York road, Jun 1988, *Bean* 845 (BRI,NSW); Wenlock, Batavia River, Jul 1948, *Brass* 19699 (BRI); Big Bend in Coen River, 2 km N of Coen, Aug 1989, *Jobson* 733 (BRI,NSW); Hann River, Qld, Aug 1975, *Staples* IBS2167 (BRI,CANB,K); 15 km east of 'Violet Vale' HS., Aug 1978, *Pajmans* 2866 (BRI); Endeavour River, north arm crossing with McIvor R.-Cooktown road, Nov 1981, *Irvine* 2175 (QRS).

Distribution and habitat: *L. madidum* subsp. *madidum* is confined to Cape York peninsula, from Bamaga to Cooktown. It occurs on the banks of freshwater creeks and rivers, in sandy soils.

L. madidum* subsp. *sativum A. Bean subsp. nov. a *L. madido* subsp. *madido* foliis angustioribus, fructibus parvioribus differt. **Typus:** Northern Territory. Margaret River, 21 September 1946, *S.T. Blake* 17075 (holo: BRI; iso: DNA).

Leaves linear, 20–45 × 1.0–4.5 mm, pale green. Fruits glabrous, hemispherical, 2.0–2.5 × 2.0–3.5 mm.

Selected specimens: Western Australia. Picaninny Creek gorge, 15 km SE of Bungle Bungle outcamp, East Kimberley, Jul 1984, *Kenneally* 9301 (CANB,NSW,PERTH); Bream Gorge, Osmund Valley station, East Kimberley, Nov 1989, *Menkhurst* 748 (DNA,MEL,PERTH). Northern Territory. Finnis River, Aug 1969, *Byrnes* 1684 (BRI,DNA); Jim Jim Falls, Sep 1984, *Dunlop* 6747 & *Wightman* (AD,DNA); Sawtooth Gorge, Nov 1972, *Byrnes* 2822 & *Martensz* (BRI); Wooler River, 16 km northwards of Telecom road on Marparu outstation road, Sep 1987, *Clarke* 1469 (DNA,NSW); Darwin area, Feb 1990, *Wightman* 4960 (BRI,DNA); Cobourg Peninsula, Jul 1982, *Dunlop* & *Wightman* 108 (DNA).

Distribution and habitat: *L. madidum* subsp. *sativum* occurs in the eastern part of the Kimberley region of Western Australia and throughout the northernmost part of the Northern Territory. It grows along riverbanks, and has often been recorded from sandstone gorges, but it is not confined to them.

Etymology: The subspecific epithet refers to the fact that this taxon has become widely cultivated in recent years.

Note: This taxon has been widely cultivated in northern Australia for several years. According to Brock (1988), it is fast growing and adapts to a wide range of well-drained soils.

3. ***Leptospermum brachyandrum*** (F. Muell.) Druce, Bot. Soc. Exch. Club British Isles 1916 Suppl. 2: 632 (1917); *Kunzea brachyandra* F. Muell., Fragm. 2: 27 (1860). **Type:** New South Wales. ad ripas fluminis Hastings, Dr. Herman Beckler (lecto: NSW n.v.; isolecto: A!).

Additional specimens: Queensland. COOK DISTRICT: Turtle Rock, 12 km SSE of Laura, Nov 1991, *Bean* 3805 (BRI, QRS). NORTH KENNEDY DISTRICT: Mt Stuart, 9 km S of Townsville, Dec 1991, *Bean* 3867 (BRI, MEL, QRS); Cockatoo Creek area, Mt Elliot, south of Townsville, Aug 1991, *Bean* 3588 (BRI, CANB, K, L, MEL, NSW, PERTH); Mingela Bluff, about 10 km E of Mingela, Sep 1989, *Cumming* 9294 (BRI); Cape Upstart peninsula, Jun 1967, *Hinson* CU4 (BRI); Stonehaven Bay, Hook Is., Jul 1985, *Warrian* CW706 (BRI).

Distribution and habitat: *L. brachyandrum* has a discontinuous distribution from northern New South Wales to northern Queensland, generally along rivers and creeks. However, in several localities in North Queensland (examples cited above), it inhabits steep rocky slopes or even cliff-faces. The hillside plants are completely smooth-barked, while the creek-dwelling plants almost always have rough bark at their bases, but in other respects, they do not appear to differ in any significant way. The respective habitats, while seemingly very different, are alike in that they are protected from fire. Perhaps this is an important determinant of its distribution.

4. ***Leptospermum parviflorum*** Valetton, Bull. Dep. Agric. Indes Neerl. 10: 39 (1907); Icon. Bogoriense 3: 93, t. 238 (1907). **Type:** New Guinea. Archip. Ind. G. Syap., *Wichmann* 52 (holo: L!).

Shrub or tree, 3–12 metres high. Bark type not recorded by collectors but appearing smooth and deciduous on herbarium specimens; young branchlets pubescent, stem flanges present, conspicuous. Leaves alternate, sessile, discolourous, linear, 20–45 × 2.0–4.5 mm, apex acute to acuminate, margins recurved in dried material, 'dark green' (*vide Foreman LAE60470, Van Royen 4798*) above, the lower surface much paler, densely silky-pubescent even on older leaves. Inflorescence consisting of 3–4 axillary bracteolate monads; bracts and bracteoles brown, oblong, shed well before anthesis. Flowers 5–7 mm in diameter; pedicels 1.0–1.5 mm long; hypanthium densely pubescent, 2.0–2.5 mm long, sepals obtuse, pubescent; petals orbicular, colour unknown; stamens c. 30, with small parallel anther cells; style inset, stigma capitate; roof of ovary glabrous except for short erect hairs at base of style and along valve margins, ovary 3-locular. Fruit thin-walled, pubescent, hemispherical, 1.5–2.0 × 2.0–2.5 mm, with valves not extending above the rim of the hypanthium, 3-locular, sepals persistent. Seeds and chaff identical, brown, cuneate, striate, c. 0.8 × 0.4 mm.

Selected specimens: Indonesia. Irian Jaya. Ransiki, Feb 1957, *Mangold* 2260 (L); Boepoel to Merau R., Merauke district, Aug 1954, *Van Royen* 4798 (A, L); between Boepoel and Tanas, Aug 1956, *Leefer* BW3224 (L, SING). Papua New Guinea. Kewa River, Sakoer, Jul 1941, *Anta* 72 (A, L, SING); Misool, Sorong, near Fakal, Sep 1948, *Pleyte* 1082 (BRI, L, SING); 10.5 km west of Aruhi, Morehead subdistrict, Jul 1974, *Foreman* LAE60470 (A, BRI, L, QRS); upper Wanggoc River basin, c. 47 miles [76 km] N of Weam Patrol Post, Aug 1967, *Paijmans* 333 (L).

Distribution and habitat: *L. parviflorum* is endemic to the island of New Guinea, occurring both in Irian Jaya and in Papua New Guinea. It grows on the banks of rivers and streams, mostly at altitudes of less than 50 metres.

Flowering period: July – September.

Affinities: *L. parviflorum* is most closely related to *L. purpurascens*. These species share the following characters; stem flanges, discolourous leaves with dense appressed hairs on leaf undersides, strongly recurved leaf margins on dried specimens and densely pubescent floral hypanthia. However, *L. parviflorum* differs by its longer leaves with acute apices.

Note: The type consists of two pieces, on separate sheets, and each has a tag bearing the number 52. The collection is undated but Valetton gave the year of collection as 1903.

5. ***Leptospermum purpurascens*** J. Thompson, Telopea 3(3): 355 (1989). **Type:** Queensland. COOK DISTRICT: 12°24'S, 143°07'E, southern end of Temple Bay in upper reaches of an unnamed creek between Glennie and Hunter inlets, 8 June 1978, *J.R. Clarkson* 2196 (holo: NSW n.v.; iso: BRI!).

Leptospermum sp. 'Mt Tozer', Thomas & McDonald, Rare & Thr. Plants of Qld 38 (1989).

Distribution and habitat: Endemic to a small area on Cape York peninsula in far northern Queensland, in the vicinity of Iron Range. It grows on rocky granitic hillsides.

6. *Leptospermum luehmannii* Bailey, Queensland Fl. 2: 592 (1900); *Agonis luehmannii* (Bailey) C. White & Francis, Bot. Bull. Dept. Agric. Queensland 22: 21 (1920). **Type:** Queensland. MORETON DISTRICT: Top of Glass House Mountain, October 1884, *F.M. Bailey* 4 (holo: BRI!).

Distribution and habitat: Endemic to skeletal slopes of trachyte hills and mountains between Elimbah and Beerwah, north of Brisbane. In recent years, this species has been reported as occurring in the Numinbah Valley (Lebler 1979; Stanley & Ross 1986; Thompson 1989). However, those records all relate to *L. trinervium* (Smith) J. Thompson (Bean 1991).

7. *Leptospermum speciosum* Schauer, in Walp., Rep., Suppl. 1: 923 (1842); *Agonis speciosa* (Schauer) C. White, Proc. Roy. Soc. Queensland 53: 218 (1942). **Type:** Queensland. MORETON DISTRICT: in Nova Cambria australi, Moreton Bay, 1824, *A. Cunningham* Herb. no. 38 (? n.v.), *fide* J. Thompson, Telopea 3(3): 357 (1989).

Distribution and habitat: Confined to coastal areas from Fraser Island in Queensland to Iluka in northern New South Wales, growing in swamps or heathlands.

8. *Leptospermum whitei* Cheel, J. & Proc. Roy. Soc. New South Wales 65: 199 (1932); *Agonis elliptica* C. White & Francis, Bot. Bull. Dept. Agric. Queensland 22: 16 (1920), non *Leptospermum ellipticum* Endl. **Type:** Queensland. MORETON DISTRICT: Beerwah, *W.D. Francis* s.n. (holo: BRI!).

Distribution and habitat: Confined to coastal areas from Rainbow Beach in Queensland to Coffs Harbour in New South Wales. It grows in swampy *Banksia* or *Eucalyptus* forests.

9. *Leptospermum trinervium* (Smith) J. Thompson, Telopea 3(3): 366 (1989); *Melaleuca trinervia* Smith in White, Voyage to New South Wales: 229, t. 24 (1790). **Type:** New South Wales. [Port Jackson, White] "t. 24, Whites voyage", Sheet 878.11 (top L.H.) herb. Smith (LINN n.v.), *fide* J. Thompson, *loc. cit.*

L. attenuatum Smith, Trans. Linn. Soc. London 3: 263 (1797). **Type:** New South Wales: Port Jackson, 1795, *Mr White*, Sheet 878.9, R.H. specimens (lecto: LINN, photo!).

Distribution and habitat: This widespread species extends from Rockhampton, Queensland to the East Gippsland district of Victoria. It grows commonly in dry sclerophyll forest in sandy soils, and also in heathland.

10. *Leptospermum lamellatum* J. Thompson, Telopea 3(3): 384 (1989). **Type:** Queensland. LEICHHARDT DISTRICT: 21 miles [34 km] SE of Bedourie Homestead, 14 October 1963, *N.H. Speck* 1843 (holo: NSW; iso: BRI, CANB).

Additional specimens: Queensland. MITCHELL DISTRICT: Sandstone Wall, White Mountains NP, 20°27'S, 145°54'E, Jul 1991, *Cunning* 11257 (BRI). SOUTH KENNEDY DISTRICT: 4 km N of 'Springvale' homestead, west of Clermont, Sep 1990, *Bean* 2375 (BRI, NSW). LEICHHARDT DISTRICT: Strike ridge south of Tomahawk Ck, east of Zig Zag Range, 'Peak Vale' holding, May 1981, *Godwin* s.n. (QRS). MARANOA DISTRICT: beside Redford road, N of Mt Hotspur, near 'Hungry Downs', 26°01'S, 147°30'E, Jun 1990, *Grimshaw* CHR6 (BRI). DARLING DOWNS DISTRICT: 12 km NW of Western Creek Forestry station, via Milmerran, Nov 1989, *Bean* 1166 (BRI).

Distribution and habitat: Endemic to Queensland, extending from the White Mountains N.P., west of Townsville to the Milmerran area in the south of the state. It is found on ridges in shallow sandy soils, usually derived from sandstone.

11. *Leptospermum microcarpum* Cheel, J. & Proc. Roy. Soc. New South Wales 57: 126 (1923). **Type:** New South Wales. Copmanhurst, November 1917, *E. Cheel* [NSW 154747] (lecto: NSW), *fide* J. Thompson, Telopea 3(3): 379 (1989).

Distribution and habitat: Occurs in coastal areas from Kilkivan in southern Queensland to Grafton in New South Wales, and also extends west to beyond Warwick. It inhabits shallow soils on rocky hills and mountainsides.

12. *Leptospermum brevipes* F. Muell., Trans. Philos. Soc. Victoria 1: 125 (1855). **Type:** Victoria. Buffalo Creek, 6 March [18]53, *F. Mueller*, MEL 1539307 (lecto: MEL; isolecto: K, MEL), *fide* J. Thompson, Telopea 3(3): 382 (1989).

Additional specimens: Queensland. DARLING DOWNS DISTRICT: Bracker State Forest, S of Inglewood, Dec 1990, *Bean* 2740 (AD, BRI, MEL, NSW); Herries Range, southern end of S.F. 444, south-west of Warwick, Dec 1990, *Bean* 2795 (BRI, NSW).

Distribution and habitat: Extends from the Warwick-Inglewood districts of Queensland, throughout New South Wales, to north-eastern Victoria. It grows in poor forests on rock outcrops and rocky hillsides, especially on granite.

13. *Leptospermum neglectum* J. Thompson, Telopea 3(3): 383 (1989). **Type:** Queensland. NORTH KENNEDY DISTRICT: 17 km west of Paluma, 9 September 1982, *E.M. Jackes & B.R. Jackes* s.n. (holo: NSW), *fide* J. Thompson *loc. cit.*

Leptospermum sp. 1, Stanley & Ross, Fl. S.E. Queensl. 2: 130 (1986).

Additional specimen: Queensland. COOK DISTRICT: Mount Mulligan, c. 40 km NW of Dimbulah, Apr 1985, *Clarkson* 5916 (BRI, L, MEL, NSW, PERTH, QRS).

Distribution and habitat: Endemic to Queensland and extends from Mt Mulligan in the north to Tiaro in the south. It grows both in eucalypt forest and on rocky hillsides with little soil development.

14. *Leptospermum sericatum* Lindley in Mitchell, J. Exped. Trop. Australia: 289 (1848); *L. stellatum* forma *sericatum* (Lindley) Domin, Biblioth. Bot. 89: 454 (1928). **Type:** Queensland. LEICHHARDT DISTRICT: near the Pyramids [Mt Playfair district], 5 September 1846, *T. Mitchell* (holo: ?, n.v.; topo: BM, photo!).

Distribution and habitat: Confined to sandstone habitats in the Leichhardt district of Queensland, including Carnarvon Gorge, Blackdown Tableland and Isla Gorge. It grows on sparsely vegetated sandstone slopes, often rooting into crevices in the rocks.

15. *Leptospermum parvifolium* Smith, Trans. Linn. Soc. London 3: 263 (1797). **Type:** New South Wales. Port Jackson, 1795, *Dr White* (holo: LINN n.v.), *fide* J. Thompson, Telopea 3(3): 363 (1989).

Additional specimen: Queensland. DARLING DOWNS DISTRICT: Coolmunda Dam, east of Inglewood, Dec 1990, *Bean* 2733 (BRI, MEL, NSW).

Distribution and habitat: The location given above is the only one known for this species in Queensland. However, it is widespread in New South Wales to as far south as the Nowra district. It grows in poor sandy soils on hillsides in dry sclerophyll forest.

16. *Leptospermum venustum* A. Bean sp. nov. affinis *L. semibaccato* Cheel foliis latioribus, ramulis persistenter pubescentibus, floribus majoribus hypanthio longiore, fructibus majoribus interdum 6-locularibus differt. **Typus:** Queensland. BURNETT DISTRICT: 'Melrose' Station, 15 km west of Eidsvold, 14 August 1990, *A.R. Bean* 2112 (holo: BRI, iso: AD, CANB, K, L, MEL, NSW, PERTH, SING).

Spreading shrub, 1.5–2.5 m high, with arching branches; bark rough, grey, scaly, closely adhering, persistent throughout; branchlets with spreading hairs up to 2 mm long, stem flanges absent. Leaves alternate, sessile or with petiole up to 1 mm long, concolourous, green, broadly elliptical, 6–13 × 3–4 mm, 3–5-veined, oil glands numerous, conspicuous; leaf base cuneate, apex acute; young leaves with long marginal hairs, glabrescent. Inflorescence consisting of single flowers, borne on short side-branches; floral bracts red-brown, glabrous, completely enclosing mature buds, shed just prior to anthesis. Flowers 18–25 mm in diameter, pedicels absent or very short, hypanthium silky pubescent, 3–4 mm long; sepals triangular, pubescent; petals deep pink fading to pale pink, orbicular, glabrous; stamens 30–40, all about the same length; anthers versatile, cells about 0.75 mm long, parallel, opening by narrow slits, gland conspicuous, globular, dark-brown;

style slightly inset, stigma capitate; roof of ovary tomentose, ovary 5(6)-locular. Fruits fleshy or succulent when fresh, globular-truncate, 5(6)-locular, 6–7 × 7–8 mm, when dried brown and wrinkled, c. 5 × 6 mm; sepals persistent. Seeds dark brown, obovoid, conspicuously reticulate, c. 1.2 × 0.6 mm. Unfertilised seeds pale yellow, linear. **Fig 1.**

Specimens examined: Queensland. BURNETT DISTRICT: 1 km N of Little Morrow Creek crossing, on Eidsvold to Cracow road, Jul 1990, *Forster* 7000 (AD,BISH,BRI,CANB,CBG,CONN,DNA,HO,K,L,LAE,MEL,MO,NSW,PERTH,PNH,PR,PRE, QRS,US); Eidsvold, *Bancroft* s.n. [AQ 041731] (BRI); 20.9 km from Eidsvold towards Cracow, N side of road, Sep 1985, *Bean* 283 (BRI); 20 km W of Eidsvold, Jul 1989, *Bean* 1103 (BRI).

Distribution and habitat: *L. venustum* is confined to a relatively small area west of Eidsvold where it grows on granitic hillsides and slopes, or beside small watercourses. It grows in eucalypt woodland often dominated by *Eucalyptus petalophylla* Brooker & A. Bean or *E. baileyana* F. Muell. On moister sites, *Lophostemon suaveolens* (Solander ex Gaertner) Peter G. Wilson & Waterhouse may be present.

Flowering period: July – October.

Affinities: *L. venustum* is closely related to *L. semibaccatum*; both species have rather fleshy fruits and silky-hairy hypanthia. *L. venustum* differs from that species by its broader leaves, persistently hairy branchlets, larger flowers and fruits, and longer floral hypanthium.

Conservation status: The suggested status is 2R, as defined by Briggs and Leigh (1988).

Etymology: This species is named for its very beautiful floral display.

Note: Because of its large, prominently displayed pink flowers, *L. venustum* is a very attractive plant, and should be introduced into cultivation. Limited trials by the author suggest that it is adaptable to garden culture.

- 17. *Leptospermum semibaccatum*** Cheel, J. & Proc. Roy. Soc. New South Wales 65: 203 (1932). **Type:** New South Wales: Wallis Island, Tuncurry, 11 May 1925, *E. Cheel* s.n. [NSW 154729] (lecto: NSW n.v.), *fide* J. Thompson, *Telopea* 3(3): 365 (1989).

Additional specimen: Queensland. PORT CURTIS DISTRICT: Deepwater N.P., 40 km east of Miriam Vale, Oct 1989, *Gibson* TO1860 (BRI).

Distribution and habitat: Confined to coastal areas from Deepwater N.P. to Forster in New South Wales. It is a common component of sandy coastal heathlands.

- 18. *Leptospermum arachnoides*** Gaertner, *Fruct. Sem. Pl.* 1: 175, t. 35 (1788). **Type:** the illustration in the above publication, based on a specimen in the Banksian herbarium (BM), *fide* J. Thompson, *Telopea* 3(3): 428 (1989).

Distribution and habitat: It has a very restricted distribution in Queensland (in the Stanthorpe area), but is widespread in New South Wales. It grows in poorly drained heathland or adjacent eucalypt forests.

- 19. *Leptospermum liversidgei*** R. Baker & H.G. Smith, J. & Proc. Roy. Soc. New South Wales 39: 124, t. 2 (1906). **Type:** New South Wales. Ballina, March 1905, *D.W. Munro* s.n. (lecto: NSW), *fide* J. Thompson, *Telopea* 3(3): 395 (1989).

Distribution and habitat: Grows only in coastal areas from Bundaberg, Queensland to Port Stephens in New South Wales. It inhabits sandy or peaty soil, in swampy heathlands.

- 20. *Leptospermum oreophilum*** J. Thompson, *Telopea* 3(3): 404 (1989). **Type:** Queensland. MORETON DISTRICT: Ngungun, Glasshouse Mountains, 13 June 1951, *L.A.S. Johnson* s.n. [NSW 154760] (holo: NSW), *fide* J. Thompson *loc. cit.*

Leptospermum sp. 'Glasshouse Mountains', Thomas & McDonald, *Rare & Thr. Plants of Queensland* 38 (1989).

Additional specimen: Queensland. MORETON DISTRICT: Mt Coolum, 3 km south of Coolum Beach, Jul 1983, *Sharpe* 3334 & *Batianoff* (BRI).

Distribution and habitat: This is a rare species confined to Mt Coolum and to several peaks of the Glasshouse Mountains. It grows on skeletal slopes on these extinct volcanic peaks, in montane heath communities.

21. *Leptospermum polygalifolium* Salisb., Prodr. 350 (1796). **Type:** juxta Port Jackson [New South Wales], legit *Dav. Burton* (holo: ?K n.v.), *fide* J. Thompson, *Telopea* 3(3): 396 (1989).

L. flavescens Smith, Trans. Linn. Soc. London 3: 262 (1797). **Type:** New South Wales: Port Jackson, 1795, *Mr White* 878.8 (holo: LINN, photo!).

Distribution and habitat: Extends from Cape Flattery on Cape York peninsula in Queensland to south of Sydney in New South Wales, and up to 500 km inland. It grows in a diversity of habitats, including heathlands, rocky hillsides and in dense eucalypt forest.

Note: This is a very complex and variable species. Thompson (1989) recognised six subspecies, and while it is true that some distinct forms do exist, there appears to be widespread intergradation between them. Furthermore, some subspecies, as typified by Thompson, are very similar indeed. For these reasons, I advocate the use of *L. polygalifolium* s. lat. only, until more intensive study is done on the species.

22. *Leptospermum variabile* J. Thompson, *Telopea* 3(3): 403 (1989). **Type:** Queensland. MORETON DISTRICT: Mt Gillies, about 20 km SW of Rathdowney on Mt Lindesay Highway, 18 October 1978, *P.R. Sharpe* 2438 (holo: NSW; iso: BRI!).

Distribution and habitat: Occurs on mountains of southern Queensland near the border with New South Wales, and into northern New South Wales. It grows on skeletal hillsides of volcanically-derived mountains, in heathland or low woodland.

Note: While the populations of *L. variabile* from the Macpherson Range and adjacent areas (including the type locality) are distinctive and worthy of recognition, other populations included by Thompson (1989) in *L. variabile* are very difficult to separate from *L. polygalifolium*. In her species key, Thompson has used an anther character to separate these species (couplet 40). However, due to the amount of variation in the anthers of *L. polygalifolium*, it is unwise to rely on this character to distinguish them. My examination of *L. variabile* in the field revealed that it has quite flaky, loosely adhering bark, in contrast to the scaly, tightly adhering bark of *L. polygalifolium*; hence bark may prove to be a better discriminator between these difficult species.

23. *Leptospermum novae-angliae* J. Thompson, *Telopea* 3(3): 405 (1989). **Type:** New South Wales: top of Bald Rock Mountain, 15 miles [24 km] north of Tenterfield, 31 March 1962, *E.F. Constable* 2074 (holo: NSW n.v.) *fide* J. Thompson *loc. cit.*

Leptospermum sp. 2, Stanley & Ross, Fl. of S.E. Queensl. 2: 132 (1986).

Distribution and habitat: In Queensland, it is known only from the Girraween N.P. near Stanthorpe, where it grows in shrubland on exposed granitic slopes. The species extends to west of Coffs Harbour in New South Wales, in similar situations.

24. *Leptospermum minutifolium* C. White, Proc. Roy. Soc. Queensland 57: 26 (1947). **Type:** Queensland. DARLING DOWNS DISTRICT: base of Mount Norman via Wallangarra, November 1944, *Mrs M.S. Clemens* (holo: BRI!).

Distribution and habitat: In Queensland, known only from Girraween N.P. and near Christie Target; in New South Wales it extends south to about Armidale. It grows in eucalypt forest, often near watercourses.

25. *Leptospermum juniperinum* Smith, Trans. Linn. Soc. London 3: 263 (1797); *L. scoparium* var. *juniperinum* (Smith) Domin, Biblioth. Bot. 89: 453 (1928). **Type:** New South Wales: Port Jackson, 1795, *J. White* s.n., herb. Smith 878.17 (holo: LINN n.v.), *fide* J. Thompson, *Telopea* 3(3): 418 (1989).

Distribution and habitat: Extends from Fraser Island in Queensland to Ulladulla in New South Wales. In Queensland it is confined to coastal areas in *Melaleuca* forests, heathlands

or sedgelands, but in New South Wales it reportedly also grows on sandstone escarpments (Thompson 1989).

26. *Leptospermum recurvum* J.D. Hook, Icon. Pl.: t. 893 (1852). **Type:** Borneo: Kina Balu, abundant, from 7000–8500 feet, whitening the top of the mountain, *H. Low* (holo: K n.v.), *fide* J. Thompson, *Telopea* 3(3): 391 (1989).

Specimens examined: Indonesia. Borneo. Kinabalu National Park, Sabah, Jul 1966, *Weber* 54680 (A,SING); East Pinnacles, Mt Kinabalu, Mar 1964, *Chew & Corner* 5877 (BRI); Gurulau Spur, Mt Kinabalu, Dec 1933, *Clemens* 50616 (A). Sulawesi. top of Kamboeno, Jul 1937, *Eyma* 1362 (A,L); Mt Roroka Timbu summit, May 1979, *Van Balgooy* 3323 (L); G. Rantemario, Jun 1937, *Emiya* 691 (L).

Distribution and habitat: *L. recurvum* occurs on the upper slopes of Mt Kinabalu in Borneo and on the highest mountains of Sulawesi (Celebes), in shallow soils, in dense shrubland or low forest.

Note: *L. recurvum* has been regarded as being endemic to Mt Kinabalu in Borneo (Merrill 1921; Thompson 1989), but specimens from the higher mountains of Sulawesi are similar to those from the type locality. The leaves of the Sulawesi specimens are not as strongly recurved, and are somewhat thinner, but are otherwise typical. Lee & Lowry (1980) record that on Mt Kinabalu, '*L. flavescens*' [= *L. javanicum*] and *L. recurvum* grow within about 30 metres of each other at Carson's Camp, and that an exhaustive search in this area failed to reveal any morphological intermediates between the two taxa. Therefore it seems that *L. javanicum* and *L. recurvum* are genetically isolated on Mt Kinabalu. Some *L. javanicum* specimens from Sulawesi approach *L. recurvum* in leaf dimensions, and it is not clear whether or not there is a gradual transition from typical *L. javanicum* to *L. recurvum* in Sulawesi.

27. *Leptospermum javanicum* Blume, Bijdr. 1: 1100 (1826); *Macklottia javanica* (Blume) Korth., Ned. Kruidk. Arch. 1: 196 (1847); *L. flavescens* var. *javanicum* (Blume) King, J. Asiat. Soc. of Bengal 70(2) (1901); Mat. for a Fl. Malay. Pen. 12: 69 (1901). **Type:** Java. in cacumine montis Gede (holo: L!, iso: L!).

Glaphyria nitida Jack, Trans. Linn. Soc. London 14: 128 (1823), non *Leptospermum nitidum* J.D. Hook. **Type:** Gunong Bunko, Sumatra (*n.v.*), *fide* E.D. Merrill, Jack's genera and species of Malaysian plants, J. Arnold Arbor. 33: 226 (1952).

Leptospermum alpestre Blume, Bijdr. 1: 1100 (1826). **Type:** in declivitibus altioribus montis Gede. (holo: L n.v.), *fide* J. Thompson, *Telopea* 3(3): 390 (1989).

L. floribundum Junghuhn, Java 1: 578 et in Nat. en Geneesk. Arch. Neerl. Indie 2: 37 (1845). **Type:** Java. 'javanicae alpinae' (holo: L!).

Tree to 6 metres high; bark fibrous; branchlets pubescent, stem flanges prominent, expanded and extending beyond leaf-base. Leaves alternate, sessile, strongly discolourous, dark green above, elliptical to obovate, 10–30 × 4–9 mm, midrib impressed above, apex obtuse; young leaves silky pubescent below, especially along margins and midrib, old leaves glabrous. Inflorescence consisting of single flowers borne on short side branches; floral bracts and bracteoles persistent, present around mature buds and shed just prior to anthesis. Flowers 15–20 mm in diameter; pedicels 0–1 mm long; hypanthium silky-pubescent; sepals obtuse, margins densely ciliate; petals white. Fruits woody, conspicuously domed above bowl-shaped base, 5-locular, 4–5 × 6–7 mm, sepals not persisting.

Selected specimens: Burma. Myinmolekat, Mergui district, Jan 1930, *Parker* 3112 (A). Indonesia. Sumatra. Gunong Singgalang, Feb 1933, *Holtum* 28106 (SING); Mt Tanggamus, Lampung province, May 1968, *Jacobs* 8233 (A); Mt Losir, Feb 1937, *Steenis* 8569 (SING). Malaya. Pahang, Bentong, Genting highlands, Sep 1979, *Bremer* 1613 (A); Mt Ulu Kali, Selangor, Malaya, Feb 1969, *Flenley* 4 (A); Padang Luas, G. Tahan, Jun 1923, *Kloss* 12199 (SING); Gunong Benom, Pahang, Mar 1967, *Whitmore* FRI3288 (A,SING). Java. Gunong Gedeh, Apr 1938, *Steenis* 10613 (BRI,L). Borneo. Mesilau Caves, Sabah, Mar 1964, *Chew & Corner* 4664 (A,BRI,SING); Marai Parai Spur, Mt Kinabalu, Nov 1915, *Clemens* 10934 (A); Bukit Raya, Jan 1983, *Nooteboom* 4610 (A,BRI). Philippines. Mt Apo, 7000ft [2100m], near Sulphur spring, Nov 1946, *Edano* 1460 (A); Mt Canlaon, Negros Occidental, Apr 1954, *Edano* 22007 (A); Mt Pulog, Luzon, Mar 1948, *Celestino* 4335 (A,SING). Sulawesi. Gunong Rantemario, Feb 1981, *Smith* 681 (L); Pokapin-djang, Jun 1937, *Eyma* 604 (A,L).

Distribution and habitat: *L. javanicum* extends from Burma to western Malesia, including Sumatra, Malaya, Java, Borneo, Philippines and Sulawesi. It is absent from the Lesser Sunda Islands and the Moluccas. It grows at altitudes of between 1500 and 3000 metres,

according to herbarium specimen label data. This is, generally speaking, higher than the altitudes occupied by *L. amboinense*.

Affinities: *L. javanicum* is closely related to *L. recurvum* (see note under that species), and to *L. wooroonooran*. It may be distinguished from *L. wooroonooran* by its pubescent floral hypanthium, larger fruits, and strongly discoloured leaves with an obtuse apex. Some specimens of *L. javanicum* from Sulawesi, e.g. Whitten 1985 (L), Eyma 604 (A,L), have obovate leaves about 14 mm long, only 1.5–2.0 times longer than broad, and with dense golden hairs on the undersides. This may represent a distinct taxon, but there is presently insufficient material on which to base a decision.

28. *Leptospermum wooroonooran* Bailey in Bailey & A. Meston, Rep. Exped. Bellenden-Ker: 40 (1889). **Type:** Queensland, COOK DISTRICT: South Peak, Bellenden-Ker, 22 June 1889, F.M. Bailey (holo: BRI!).

Additional specimen: Queensland, COOK DISTRICT: Devils Thumb, Oct 1981, Godwin s.n. (QRS).

Distribution and habitat: This species is confined to two small disjunct areas of northern Queensland. One is the Mossman Gorge-Devils Thumb-Main Coast Range area west of Mossman, and the other is along the Bellenden Ker range south of Gordonvale. It inhabits high-altitude microphyll 'cloud' forests.

29. *Leptospermum amboinense* Blume, Bijdr. 1: 1100 (1826); *Macklottia amboinensis* (Blume) Korth., Ned. Kruidk. Arch. 1: 196 (1847). **Type:** Moluccas, Amboina, collector unknown (holo: L!).

L. annae Stein in Regel, Gartenflora 34: 66 (1885). **Type:** Mt Apo, Philippines, February 1882, Dr. A. Schadenberg (n.v.).

L. flavescens var. *angustifolia* Ridley, Fl. Malay Pen. 1: 713 (1922). **Type:** Malaya, Kedah Peak (n.v.).

L. petersonii subsp. *lanceolatum* J. Thompson, Telopea 3(3): 394 (1989). **Type:** New South Wales, cultivated Castle Hill [Sydney] from seed ex Herberton dist., September 1965, C. Debenham s.n. (holo: NSW!, iso: BRI!).

Tree to 9 m high; bark rough, grey to brown, fibrous, longitudinally fissured, persistent throughout; branchlets glabrous, stem flanges prominent, broad, sometimes extending beyond leaf base. Leaves alternate, sessile, slightly discoloured or concolourous, pale to mid-green, narrowly elliptical, 18–30 × 3–5 mm, midrib scarcely visible, not impressed above; apex acute or obtuse; young leaves with silky appressed hairs on underside, glabrescent. Inflorescence consisting of single (rarely up to 4) flowers borne on short side-branches; floral bracteoles and bracts shed well before anthesis. Flowers 12–18 mm in diameter; pedicels 0–1 mm long; hypanthium glabrous or occasionally pubescent, obconical to hemispherical; sepals obtuse, margins ciliate; petals white. Fruits sessile, woody, conspicuously domed above an obconical to hemispherical hypanthium, (4)5-locular, 3–4 × 4.0–5.5 mm, sepals not persistent on fruit. Seeds and chaff identical, brown, linear, striate, c. 2.0 × 0.2 mm.

Selected specimens: Indonesia, Sumatra, Brastagi, Dec 1930, Symington CF25120 (SING). Malaya, Gunong Ledang (Mt Ophir), Jul 1969, Whitmore FRI12354 (A,SING); Gunong Panti, Johore, Dec 1970, Shukor AS1 (BRI); Gunong Jerai (Kedah Peak), Jan 1964, Burkill HMB3324 (SING). Lesser Sunda Islands, Manau near Ruteng, W. Flores, Apr 1965, Kostermans & Wirawan 594 (A,L); summit of Gunong Ranaka, Flores, Mar 1973, Verheijen 3359 (L). Borneo, Mt Santubong, Sarawak, s.d., Mjoberg 238 (A); Summit of Mt Retak, Brunei, Jan 1989, Wong WKM820 (SING). Philippines, Surigao Province, Apr 1919, Ramos & Pascasio 34493 (BRI,NSW); Baklayan, Mt Apo, Mindanao, Nov 1946, Edaño 1371 (SING); Dinagat Island, Mindanao, May 1931, Ramos & Convozar 84002 (A,SING). Sulawesi, South slope of Mt Bonthain, Jul 1976, Meijer 11042 (L). Moluccas, Manipa Island, May 1940, Curran 321 (A); Kp. Waai, Gunong Salahoetoe, Ambon, Oct 1938, Buvalda 6207 (A); Kaibobo-Oernitoe, W. Ceram, Feb 1938, Eyma 2980 (SING). Australia, Queensland, COOK DISTRICT: Hoop Pine area, near McIvor, Sep 1960, Smith 11147 (BRI); Big Tableland, near Cooktown, Jul 1952, Flecker 14258 (BRI). NORTH KENNEDY DISTRICT: Frederick Peak, 25 km SW of Townsville, May 1991, Bean 3205 (BRI); Roma Peak, 40 km S of Bowen, Jun 1991, Bean 3364 (BRI,K,L,MEL,NSW,SING).

Distribution and habitat: *L. amboinense* is widespread in Malesia, occurring in Malaya, Sumatra, Borneo, Sulawesi, the Moluccas, Flores and the Philippines. Its altitudinal range in Malesia is 50–2000 metres, according to herbarium specimen label data. In general this is below the altitudes occupied by *L. javanicum* although their altitudinal

ranges certainly overlap. The species also grows in coastal areas of northern Queensland, from Cooktown to Bowen. It inhabits shallow soils, often adjacent to wet sclerophyll forest or rainforest. It is possibly absent from Java, as I have not seen any authentic *L. amboinense* specimens from there.

Affinities: *L. amboinense* cannot convincingly be separated from *L. petersonii* subsp. *lanceolatum* J. Thompson and are thus considered conspecific. The leaf dimensions of Australian material are well within the range of those of *L. amboinense* in Malesia. Similarly, flowers of the two taxa are, on average, the same size and characteristics of their hypanthium, anthers and ovary do not differ significantly. There is no significant difference between the fruits of Australian and Flores material; they are the same size and shape, and in both cases the domed apex is highest away from the style.

L. amboinense is very closely related to *L. petersonii* Bailey, but the latter has been maintained at the species level here, as the two can be separated on leaf and fruit characters. *L. petersonii* has broader fruits with a flat or shallow base when open, and leaves which are usually lemon-scented and have a minutely retuse apex.

L. amboinense can readily be distinguished from *L. javanicum* by its narrower, almost concolourous leaves, usually glabrous floral hypanthium, early shedding bracts and smaller fruits.

Note: A form of *L. amboinense* from Big Tableland near Cooktown is unusual in that it has 2–4 flowers per inflorescence.

30. *Leptospermum petersonii* Bailey, Queensland Agric. J. 15: 781 (1905). Type: Queensland: Wilsons Peak, January 1905, *W.J. Peterson* (holo: BRI!; iso: NSW).

Additional specimens: Queensland. WIDE BAY DISTRICT: Mt Tinbeerwah, 6 km west of Tewantin, Dec 1990, *Bean* 2820 (BRI, NSW); DARLING DOWNS DISTRICT: Red Rock Gorge, near Ballandean, Jan 1940, *Smith* 742 (BRI).

Distribution and habitat: *L. petersonii* extends from Mt Tinbeerwah to near Port Macquarie in New South Wales. It grows on rocky escarpments and watercourses, usually adjacent to wet sclerophyll forest. Thompson (1989) refers to the distribution of *L. petersonii* [subsp. *petersonii*] extending north to Fraser Island. This record is apparently based on a single specimen which is held at BRI. On the label, it is stated that the plant was probably cultivated. Furthermore, the deep sandy soils of Fraser Island would be an unusual habitat for *L. petersonii*, which in Queensland is otherwise confined to skeletal rocky slopes. It is therefore more likely that Mt Tinbeerwah represents the northern limit of the species.

31. *Leptospermum gregarium* J. Thompson, Telopea 3(3): 411 (1989). Type: New South Wales: 10 km from Ebor on Guyra road, 23 July 1981, *J. Thompson* 4196 (holo: NSW n.v.), *vide J. Thompson loc. cit.*

Additional specimen: Queensland. DARLING DOWNS DISTRICT: Girraween National Park, Portion 125, between Bald Rock and South Bald Rock, Aug 1977, *Grimshaw* s.n. [AQ 438016] (BRI).

Distribution and habitat: Very rare in Queensland, known only from within a few kilometres of the New South Wales border. In the latter state, it extends throughout the northern tablelands and into parts of the western slopes. It grows in high-altitude heathy swamps.

Multi-access key to the *Leptospermum* species of northern Australia and Malesia

Instructions: Select a character. Decide which character state is appropriate for the *Leptospermum* specimen you wish to identify. List the numbers adjacent to that character state. The numbers represent the species as listed in the text. Select a second character, choose the appropriate character state, and list the second set of numbers below the first. Compile a 'current' list comprising those numbers common to both lists. Select a third character, choose the appropriate character state and compare this third set of numbers with the current list. The numbers common to both of these lists becomes the new current list. Identification is achieved when only one number remains. Note that some closely related species pairs cannot always be distinguished using this key. In these cases, it will be necessary to resort to the dichotomous key or species descriptions. Also note that the 'Distribution' character should not be used for cultivated plants of unknown origin.

| Character | Character State | Species possessing that character state |
|------------------------------|--------------------------------------|--|
| Distribution (Queensland) | Moreton or Wide Bay | 3,6,7,8,9,11,13,17,19,20,21,22,25,30 |
| Pastoral Districts) | Darling Downs | 3,9,10,11,12,15,18,21,23,24,30,31 |
| | outside these Districts | 1,2,3,4,5,9,10,13,14,16,17,21,26,27,28,29 |
| Stem Flanges | Present | 3,4,5,14,20,21,22,23,24,25,26,27,28,29,30,31 |
| | Absent | 1,2,6,7,8,9,10,11,12,13,14,15,16,17,18,19 |
| Leaf length (largest leaves) | <9 mm | 5,11,14,15,16,17,18,19,21,23,24,25,26,31 |
| | 9–15 mm | 5,9,11,12,13,16,17,20,21,22,23,25,27,28,31 |
| | >15 mm | 1,2,3,4,6,7,8,9,10,12,13,20,22,27,28,29,30 |
| Bark Type | smooth, deciduous | 2,3,4,5,6,31 |
| | papery/fibrous, loosely attached | 3,7,8,9,10,11,22,31 |
| | fibrous/stringy, firmly attached | 1,8,14,15,20,24,26,27,28,29,30 |
| | scaly, not fibrous, closely adhering | 12,13,14,15,16,17,18,19,21,23,24,25 |
| Leaf apex | obtuse or minutely retuse | 5,6,9,12,13,14,17,19,21,24,26,27,29,30 |
| | acute, not prickly | 1,2,3,4,7,8,9,10,12,13,14,15,16,17,20,21,22,26,27,28,29,31 |
| | acute, prickly | 1,18,23,25 |
| Floral hypanthium | glabrous | 1,2,3,6,19,20,21,22,23,24,25,26,27,28,29,30,31 |
| | pubescent | 2,4,5,7,8,9,10,11,12,13,14,15,16,17,18,19,25,27,31 |
| Fruit diameter | <5 mm | 2,3,4,5,6,8,9,10,11,12,13,14,15,26,28,29 |
| | >5 mm | 1,7,16,17,18,19,20,21,22,23,24,25,27,28,29,30,31 |
| Number of loculi in fruit | Three | 2,3,4,5,6,7,8,11,17 |
| | Four | 9,10,11,12,13,15,17,19,29 |
| | Five or more | 1,9,10,11,12,13,14,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31 |
| Sepals persistent in fruit? | Yes | 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,29,30 |
| | No | 19,20,21,22,23,24,25,26,27,28,29,30,31 |

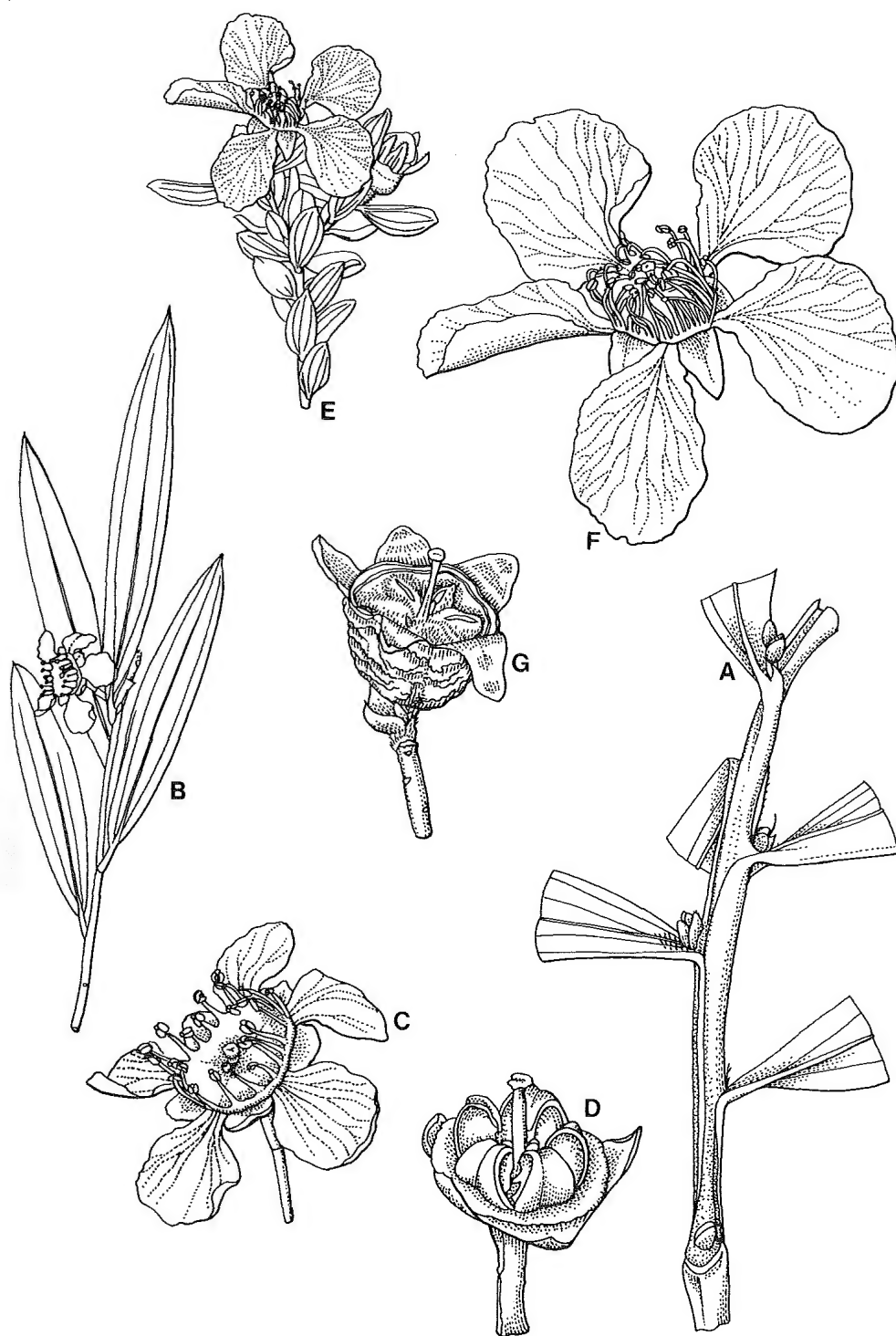


Fig. 1. *Leptospermum petersonii*: A. twig with stem flanges $\times 6$. *Leptospermum pallidum*: B. flowering twig $\times 1.5$. C. flower $\times 3$. D. fruit $\times 3$. *Leptospermum venustum*: E. flowering twig $\times 1.5$. F. flower $\times 3$. G. fruit $\times 3$. A, Thompson 4156; B,C, Bean 1068; D, Bean 2949; E,F Forster 7000; G, Bean 2112.

Dichotomous key to the *Leptospermum* taxa of northern Australia and Malaysia

1. Largest leaves more than 18 mm long 2
Largest leaves less than 18 mm long 16
2. Stem flanges present, conspicuous 3
Stem flanges absent or scarcely visible 8
3. Fruits <4 mm in diameter, 3-locular, not domed; 3–8 flowers per
inflorescence; bark smooth, at least on branches 4
Fruits >4 mm in diameter, (4)5-locular, domed; 1 flower per inflores-
cence; bark rough throughout 5
4. Hypanthium glabrous; leaves concolourous; roof of ovary
glabrous *L. brachyandrum*
Hypanthium pubescent; leaves discolourous; roof of ovary hairy along
valve margins *L. parviflorum*
5. Sepals glabrous at anthesis; fruits 7–10 mm in diameter *L. variable*
Margins of sepals hairy at anthesis; fruits 4–7 mm in diameter 6
6. Leaves 4–7 times longer than wide 7
Leaves 2–4 times longer than wide 27
7. Leaf apex obtuse or acute; fruits 4.0–5.5 mm in diameter, (4)5-locular,
base of open fruit usually hemispherical *L. amboinense*
Leaf apex minutely retuse; fruits 5–7 mm in diameter, 5-locular, base of
open fruit bowl-shaped or almost flat *L. petersonii*
8. Pedicels >8 mm long *L. pallidum*
Pedicels absent or up to 4 mm long 9
9. Fruits 3-locular; inflorescence 3- or more-flowered 10
Fruits 4–5-locular; inflorescence 1–2-flowered 14
10. Flowers and fruits in sessile clusters; bark rough 11
Flowers and fruits in axillary racemes; bark smooth 12
11. Inflorescence 15–20-flowered; leaves 7–11 mm wide, base obtuse *L. speciosum*
Inflorescence 4–6-flowered; leaves 4–5 mm wide, base cuneate *L. whitei*
12. Leaves dark green, apex obtuse; plants growing on rocky hillsides *L. luehmannii*
Leaves pale green, apex acute; plants growing along watercourses 13
13. Leaves 1.0–4.5 mm wide; fruits 2.0–3.5 mm across *L. madidum* subsp. *sativum*
Leaves 4.5–9.0 mm wide; fruits 3.5–5.0 mm across *L. madidum* subsp. *madidum*
14. Bark grey, scaly, closely adhering; fruits with a shallow dome, stigma
>2 times width of style *L. neglectum*
Bark brown, papery, loosely adhering; fruits without a dome, stigma <2
times width of style 15
15. Leaves 8–15 times longer than wide; pedicels 2–4 mm long *L. lamellatum*
Leaves 4–6 times longer than wide; pedicels 1.0–1.5 mm long *L. trinervium*

- | | |
|--|--------------------------|
| 16. Leaves prickly | 17 |
| Leaves not prickly | 20 |
| 17. Stem flanges present | 18 |
| Stem flanges absent | 19 |
| 18. Leaves 2–3 mm wide; fruits 5.0–6.5 mm long | L. novae-angliae |
| Leaves 0.8–1.5 mm wide; fruits 3–4 mm long | L. juniperinum |
| 19. Old leaves hairy; fruits 6.5–8.0 mm in diameter | L. arachnoides |
| Old leaves glabrous; fruits 3–4 mm in diameter | L. microcarpum |
| 20. Stem flanges present, conspicuous | 21 |
| Stem flanges absent or scarcely visible | 30 |
| 21. Largest leaves <6 mm long | 22 |
| Largest leaves >6 mm long | 23 |
| 22. Leaves strongly recurved; margins of sepals hairy | L. recurvum |
| Leaves not recurved; sepals glabrous throughout | L. minutifolium |
| 23. Fruit not woody or domed, sepals persisting | 24 |
| Fruit woody and domed, sepals not persisting | 25 |
| 24. Bark smooth; fruit 3-locular; leaves 2.5–4.0 mm wide | L. purpurascens |
| Bark rough; fruit 5-locular; leaves 1.5–3.0 mm wide | L. sericatum |
| 25. Bark ± smooth; papery layers shed from hypanthium of fruit | L. gregarium |
| Bark rough; hypanthium of fruit without papery layers | 26 |
| 26. Margins of sepals hairy at anthesis; leaves mostly >4 mm wide | 27 |
| Sepals glabrous at anthesis; leaves <4 mm wide | 28 |
| 27. Leaves concolourous, strongly 3-veined, apex acute; floral hypanthium glabrous | L. wooroonooran |
| Leaves discolourous, not markedly 3-veined, apex usually obtuse; floral hypanthium usually pubescent | L. javanicum |
| 28. Base of open fruit almost flat; leaves 3.5–4.0 mm wide | L. oreophilum |
| Base of open fruit hemispherical to obconical; leaves 1–4 mm wide | 29 |
| 29. Bark papery or fibrous, loosely adhering; leaves 13–22 mm long; fruits 7–10 mm in diameter | L. variabile |
| Bark scaly, closely adhering; leaves 6–15 mm long; fruits 5–8 mm in diameter | L. polygalifolium |
| 30. Sepals not persisting on fruit; leaves lemon-scented | L. liversidgei |
| Sepals persisting on fruit; leaves not lemon-scented | 31 |
| 31. Fruit succulent, becoming wrinkled after seed shed, sessile | 32 |
| Fruit dry, thin-walled, not wrinkled after seed shed, pedicellate | 33 |
| 32. Leaves 3–4 mm wide; floral hypanthium 3.5–4.0 mm long; dehiscent fruits 5–6 mm long, 5(6)-locular | L. venustum |
| Leaves 1.5–3.0 mm wide; floral hypanthium 2.0–2.5 mm long; dehiscent fruits 4–5 mm long, (3)4–5-locular | L. semibaccatum |

33. Leaves 3–5 mm long **L. parvifolium**
Leaves 6–18 mm long 34
34. Valves not projecting above rim of fruit; bark papery **L. trinervium**
Valves projecting above rim of fruit; bark scaly 35
35. Leaves 6–10 mm long; floral bracts persisting to anthesis **L. sericatum**
Leaves 10–18 mm long; floral bracts not persisting to anthesis 36
36. Pedicels c. 1 mm long, fruit dome about half hypanthium length **L. neglectum**
Pedicels 3–4 mm long, fruit dome about equal to hypanthium
length **L. brevipes**

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THE CIRCUMSCRIPTION OF *ADIANTUM DIAPHANUM* BLUME (ADIANTACEAE), THE FILMY MAIDENHAIR FERN

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Summary

The circumscription of *Adiantum diaphanum* Blume with respect to *A. setulosum* J. Smith is discussed. It is concluded that the two are conspecific and that the earlier name *A. diaphanum* should be retained. The applicability of frond hairs to the taxonomy of *Adiantum* is reviewed and the conclusion reached that hair morphology is a reliable taxonomic character but that, with few exceptions, location and density of occurrence of hairs on the various frond surfaces are characters of dubious value.

Introduction

Adiantum diaphanum Blume (the accepted name for the filmy maidenhair fern in Australia) is a delicate fern with a widespread distribution in the Malesian-Pacific region. In Australia, it rarely occurs far from water (in some situations it is a seasonally or sporadically inundated rheophyte), commonly growing on rocks or soil along creeks and rivers in closed forest. The taxon occurs along the east coast from Cape York to Victoria and on Norfolk Island. Its extra-Australian distribution encompasses New Zealand, southern China (Hainan), Vietnam, Malesia, Taiwan and Japan; as well, it extends eastward in the Pacific as far as Fiji (Hooker 1858; Brownlie 1969, 1977; Brownsey & Smith-Dodsworth 1989; Pichi Sermolli 1991).

Recently, Price (1987, 1990) reinstated the name *Adiantum setulosum* J. Smith, long considered a synonym of *A. diaphanum*; he restricted the usage of the latter name to Javan plants (which he stated, incorrectly, bear glabrous indusia), and applied the former name to plants from the remainder of the range. I am unhappy with this cavalier treatment of the filmy maidenhair fern, and offer the following arguments in support of the retention of *Adiantum setulosum* J. Smith in the synonymy of *Adiantum diaphanum* Blume.

Discussion

Two interesting morphological features characterise the filmy maidenhair fern. One presumed constant character, which serves to separate this fern from all other species of *Adiantum*, is the proliferous nature of the roots (Brownsey & Smith-Dodsworth 1989, Pichi Sermolli *op. cit.*). Although small tubers similar to those found on the roots of this species also occur on the roots of *A. novae-caledoniae* Keys. (reported by Page 1979), and confirmed by me after examination of herbarium specimens at the National Herbarium of New South Wales (NSW)), *A. diaphanum* is apparently the only species in the genus to form clonal colonies by proliferation from root buds.

The other feature which is diagnostic of *A. diaphanum* is the presence of dark setae between the veins on the lamina of ultimate segments, and the corresponding presence of similar setae on the outer surface of the soral flap (often loosely called 'indusium' or 'false indusium'). The setae are quite rigid, straight or slightly curved, thick-walled, unicellular above the associated, somewhat bulbous, epidermal cell (see Zimmer (1989) for micrographs), and may be quite evenly distributed over the lamina, or confined to the proximal basiscopic portion of the adaxial surface of the pinnule. On rare occasions some setae are present on rachises, which are otherwise normally glabrous. One form of the taxon, moderately well represented among herbarium specimens, has sparsely distributed robust setae on the adaxial lamina surface, but the abaxial lamina surface is best described as hirsute, with a few robust setae intermixed with very numerous shorter and thinner hairs; for example, a mean density of 17 shorter hairs per mm², in contrast to a mean density of 0.75 robust setae per mm² (Andrews 229 & Dockrill, BRI, 4 pinnules sampled). Brownsey (1987) indicates that this is the common form of the species in New Zealand.

Previously, Brownsey (1987) reported the presence in New Zealand of colonies of this fern in which all or the majority of plants were glabrous. He appealed (*op. cit.*) for field workers to record the proportion of glabrous to non-glabrous colonies, and gave some brief statistics on his and fellow workers observations in New Zealand. During my revision of Australian genera of Adiantaceae (other than *Cheilanthes*) for the 'Flora of Australia', I have examined more than 135 specimens of *Adiantum diaphanum* (including 75 from Australia) from most of the range of this species (the principal exceptions were Vietnam, China, Malaysia, Japan and Fiji). Only one herbarium specimen (Papua New Guinea, Carr 11943, CANB) was entirely devoid of setae. On about one-third of the remaining specimens the soral flaps were glabrous, but some (or all) pinnules bore at least one seta on their lamina. Some colonies representing the latter form (sometimes bearing only one seta on a frond) have been found in the Upper Tallebudgera valley south of Brisbane (Bostock & McDonald s.n., Dec 1990, BRI), in close proximity to more typically hairy plants.

The type of *Adiantum diaphanum* held at L consists of three sheets all apparently labelled as such by Blume, by comparison with his handwriting sample in van Steenis-Kruseman (1950). Sixteen separate plants are present on the sheets, and are morphologically quite similar. All individuals on the type sheets which retain their roots bear root tubers, and all specimens have setae on both lamina and soral flaps, albeit quite sparsely. The implication by Price that the type of *A. diaphanum* Blume has glabrous indusia is therefore erroneous.

Of 47 other Leiden Herbarium specimens I examined, all from the Malesian region, 17 were without setae on the soral flaps, although none were completely devoid of setae on the lamina. Geographically, these 47 specimens covered the major islands of Taiwan, Sumatra, Java, Timor, Flores and New Guinea. Javan specimens, excluding the type, accounted for 18 specimens of the 47, and 8 of these bear glabrous soral flaps. This is at variance with the statement by Price (*op. cit.*) that all plants from Java, the origin of Blume's type, have glabrous soral flaps. There is no justification whatsoever for using the name *A. diaphanum* Blume solely for plants with glabrous soral flaps.

Parallels to the pattern of trichome distribution in *A. diaphanum* may be found in other Australian/New Zealand species of *Adiantum*. For example, *Adiantum formosum* R. Br. exists in two forms, identical except that in one form the abaxial lamina surfaces are finely hirsute and in the other, the lamina surfaces are glabrous. Both forms bear multicellular, antrorse hairs on the adaxial surface of the rachises and petiolules. No pattern can be found in the distribution of the two forms in Australian samples. Of two New Zealand specimens seen by me, one was glabrous abaxially (Manawatu Gorge, 40°25'S, 175°45'E, Oct 1977, Given 10552 & Purdie, CANB), the other, hairy (*s. loc.*, c. 1860, ? Hooker J.D. [HO102726], HO).

One cultivated specimen of *Adiantum hispidulum* var. *whitei* (Bailey) P. Bostock examined (Mt Petrie, Apr 1986, Peach s.n., BRI) lacks hairs on the frond, except among the sporangia (a unique feature of this taxon apparently linked to the aberrant deltoid form of the lamina) (Bostock 1987). *Adiantum hispidulum* normally has a helicoid lamina bearing pale, mostly multicellular hairs on both adaxial and abaxial surfaces, including the adaxial (outer) surface of the soral flap. Two specimens of another, as yet unnamed, variant of *A. hispidulum*, from northern Australia, previously identified as *A. aethiopicum* L., are also glabrous on all surfaces, including the lamina, except for the presence of *whitei*-type setae among the sporangia (Russell-Smith 2661, 3916 & Lucas, both DNA). In addition, the holotype of *A. tenue* var. *bicolor* Domin (= *A. hispidulum* Sw.) (Domin 356, PR), has glabrous soral flaps and, atypically for *A. hispidulum* s.l., very sparsely hairy lamina and rachis surfaces. Yet another form of trichome variation in *A. hispidulum* s.l., that is, variation between taxa in the relative frequencies of occurrence of lamina hairs of different size classes, has been dealt with by Parris (1980) in her discussion of the relationship between *A. hispidulum* Sw. and *A. pubescens* Schkuhr.

Although evidence from genetic analysis techniques is lacking, e.g. from isozyme studies, the available circumstantial evidence suggests that only one (in *Adiantum diaphanum* and *A. formosum*) or a few gene loci (*Adiantum hispidulum*) are involved in the observed patterns of lamina and rachis hairs. Whether this interpretation is correct or not, I believe that it is not valid to use distribution patterns of lamina hairs, i.e.

presence/absence or numbers of hairs per mm², as a principal or indeed sole character for separation of taxa at the species level in *Adiantum*. This is particularly the case in *A. diaphanum*, which shows similar admixtures of genotypes, as expressed in the pattern of distribution of setae, in many widely separated regions. However, the morphology of lamina and rachis hairs, where these are present, is demonstrably constant and, in conjunction with other morphological features, can clearly separate the above-mentioned species of *Adiantum*.

Taxonomy

Adiantum diaphanum Blume, *Enum. pl. Javae*, fasc. 2: 215 (1828). **Type:** Linga Jattie, Java, [Oct 1824, *vide* van Steenis-Kruseman (1950)], *Blume* 649 (L 908.275-1003, 908.275-1004, 908.275-1019) (holo: L!).

Adiantum setulosum J. Smith, *Comp. Bot. Mag.* 72: 22 (1848). **Type:** cultivated plant, introduced in 1845 to Royal Gardens, Kew, from Norfolk Island, by Dr. McWilliam (holo: BM, *n.v.*).

Adiantum tenue var. *commutatum* Domin, *Biblioth. Bot.* 85: 153 (1913), **syn. nov.** **Type:** Picnic Creek, south of the Russell River, north Qld, 1910, *K. Domin Iter Australiense* 357 [PR 523609]. (lecto: PR! [left hand specimen, here designated; the detached frond on the right hand side is of *A. hispidulum* Sw.]).

[*Adiantum affine* auct. non Willd. (1810): Hook., *Sp. fil.* 2: 32 (1858); *Adiantum diaphanum* var. *affine* (Hook.) van Ald. van Ros., *Malayan Ferns* 323 (1908); K. Domin, *Biblioth. Bot.* 85: 151 (1913)].

Other synonyms may exist (for examples, see Brownsey *et al.*, 1985 and Brownsey, 1987), but they are secondary to the arguments presented here. *A. setulosum* J. Smith is considered synonymous with *A. diaphanum* Blume and rejected on the grounds of priority.

Illustrations: W.J. Hooker, *Spec. fil.* 2: t. 80C (1858); F.M. Bailey, *Lithogr. ferns Queensland* 62 (1892); Duncan and Isaac, *Ferns and allied plants of Victoria, Tasmania and South Australia* Fig. 13.4, 13.8, 13.10 (1986).

Roots proliferous, bearing small \pm barrel-shaped tubers. Rhizome erect, tufted, c. 3 mm diameter; scales concolorous, golden-brown, with an entire margin and a prominent apical seta. Fronds tufted, to 36 cm long. Stipes to 18 cm long, smooth adaxially, scabrous abaxially. Lamina 5–18 cm long, 2–13 cm broad, subpedate, hastate or narrow-triangular, 1-pinnate, or 2- (rarely 3-) pinnate at the base and 1-pinnate above, membranous. Rachises glossy, glabrous or very rarely bearing a few setae, flexuose. Decom-pound basal pinnae, when present, 1–3 (rarely more), narrow-triangular, 1- or 2-pinnate. Ultimate segments dimidiate, rectangular to subtrapeziform, with shallowly lobed and often broadly-curved distal margins, becoming cuneate-flabellate in apical segments, sparsely to very sparsely setose adaxially and hirsute to sparsely setose (rarely glabrous) abaxially; setae dark brown, unicellular, acicular, straight or slightly curved. Veins dark brown near the petiole, elsewhere pale. Sori 1–10 along distal margins, usually 1 per lobe. Soral flaps orbicular to subreniform, deeply immersed in the lobe, glabrous or bearing unicellular setae similar in form to those of the lamina. Spores yellow; perine scabrous; diameter 25.6–51.9 μ (mean 33.9 μ from 25 spores measured from each of 4 specimens).

Selected specimens. Taiwan. Shakko, Dec 1913, *Faurie* 251 (L). Borneo. Mt Kinabalu, Dec 1913, *Clemens* 27513 & *Clemens* (L). Sumatra. *s. loc.*, *Korthals* [L 908.275-1015] (L). Java. M. Tenggen, *Zollinger* 2576 (L). Timor. *s. loc.*, 1882-1883, *Forbes* 3864 (L). Flores. Rangat (Ko) Liang, *Schmutz* F97 (L). Moluccas. Ceram ['Seram'], near Saunula, 3°15'S, 129°29'E, Jul 1968, *Kato* C-11397 *et al.* (L). Bali. Kintamani, Apr 1950, *Holstvoogd* 876 (L). Papua New Guinea. Koitaki, Apr 1935, *Carr* 11943 (CANB); Wau, *Croft* 661 (BRI, LAE); Kainantu, Jul 1969, *Henty* LAE72446 & *Katik* (BRI, LAE). Australia. Queensland. COOK DISTRICT: near Cape Tribulation, 16°16'S, 145°28'E, Jun 1988, *Forster* 4376 & *Tucker* (BRI, CBG, L, NSW); SFR 675, Little Mulgrave River, 17°08'S, 145°43'E, May 1975, *Andrews* 229 & *Dockrill* (BRI). MORETON DISTRICT: gully 6 km W of Landsborough, 26°48'S, 152°54'E, Mar 1986, *Bostock* 210 (BRI). New South Wales. Mooball, c. 1 km N of town on Pottsville Rd, 28°25'S, 153°32'E, Apr 1983, *Jones* 1003 (BRI); Norfolk Id, Mt Pitt Reserve, 29°01'S, 167°57'E, Jun 1986, *Duncan* 86088N (MEL). Victoria. Deadlock Ck, tributary of Tarwin R., 38°10'S, 146°00'E, Mar 1977, *Duncan* 77114 (MEL). New Zealand. Haruru Stream, c. 30 km NW Auckland, Rodney County, North Is., 36°34'S, 174°30'E, May 1979, *Gardner* 2417 (HO). New Caledonia. *s. loc.*, *s. coll.* #135 [AQ142462] (BRI).

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NOTES ON *LYCOPODIELLA* HOLUB (LYCOPODIACEAE) IN NORTH-EASTERN QUEENSLAND

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Summary

Five species of *Lycopodiella* occur in Australia including *L. limosa* here described as new and compared with *L. serpentina* (Kunze) B. Ollg. A key to the Australian species and distribution maps are provided. An unusual growth form in *Lycopodiella serpentina* is discussed.

1. *Lycopodiella limosa* Chinnock, **sp. nov.** haec ab *Lycopodiella serpentina* foliis in ramos prostratos 6–11 mm longis; foliis in ramos strobiliferos verticillatis vel subverticillatis, internodiis 7–8 mm longis; sporophyllis marginibus nonciliatis, irregulariter laceratis vel dentatis differt. **Typus:** Queensland. COOK DISTRICT: Canal Creek, Cape York Peninsula, 4 September 1979, B. Gray 1511 (holo: QRS).

Vegetative branches prostrate, creeping, adpressed to substrate, with thick white dichotomously branched roots at intervals along the undersurface; leaves isophyllous, densely crowded along branches, absent from undersurface, erect, narrowly linear-triangular, acuminate, thick, margins entire, 6–11 mm long, 1.0–1.8 mm wide at base. Strobiliferous branches undivided, erect; leaves markedly reduced compared with those on vegetative branches, whorled or subwhorled, lanceolate-triangular, base thickened, 3.5–4.0 mm long, 0.8–1.0 mm wide at base, internodes between successive leaf whorls/subwhorls 7–8 mm long, leaves not overlapping. Strobilus to 5.5 cm long, about 3 mm wide; sporophylls free to base, imbricate, in alternating whorls of four, ovate, acuminate, margins scariose, nonciliate, irregularly lacerate or irregularly coarsely toothed in basal part, 2.5–2.8 mm long, 1.2–1.5 mm wide. Sporangia isovalvate, reniform, 0.7–1.0 mm long, 1.2–1.4 mm wide. **Fig 1.**

Specimens examined: Australia. Queensland. COOK DISTRICT: N of Jardine River about 26 km S of Bamaga, Oct 1971, Dodson s.n. (BRI); between east coast and Escape River, Aug 1978, Pajmans 3063 (BRI).

Distribution and habitat: *Lycopodiella limosa* is known only from northern Cape York Peninsula, Queensland where it occurs in swampy areas in open forest and in shady organic swampy soils in *Melaleuca/Gahnia* and *Grevillea/Melaleuca/Banksia* low shrubland.

Etymology: The species derives its name from its preference for muddy soils in swamps.

Lycopodiella Holub is one of four genera recognised by Ollgaard (1987) in his revision of the Lycopodiaceae. The genus consists of about 40 species found in moist temperate and tropical regions of the world but with the majority of species found in the Americas.

Five species occur in Australia extending across northern Australia down the east coast to Victoria and Tasmania and with scattered occurrences in south-west Western Australia and South Australia (see **Maps 1–5**). *Lycopodiella limosa* belongs to *Lycopodiella* sect. *Caroliniana* (Bruce) B. Ollg. and is closely allied to *L. serpentina*, the only other Australian species in this section. Of the remaining three species *L. lateralis* and *L. diffusa* belong to *Lycopodiella* sect. *Lateristachys* (Holub) B. Ollg. and *L. cernua* in *Lycopodiella* sect. *Campylostachys* (K. Muller) B. Ollg. The Australian species can be distinguished as follows:

- | | |
|--|------------------|
| 1. Strobili nodding, terminal on large dendroid branchlet systems | L. cernua |
| Strobili erect, terminal or lateral | 2 |
| 2. Branches prostrate adhering to substrate; strobili terminal on undivided erect branches | 3 |
| Branches prostrate or erect, not adhering to substrate; strobili lateral | 4 |

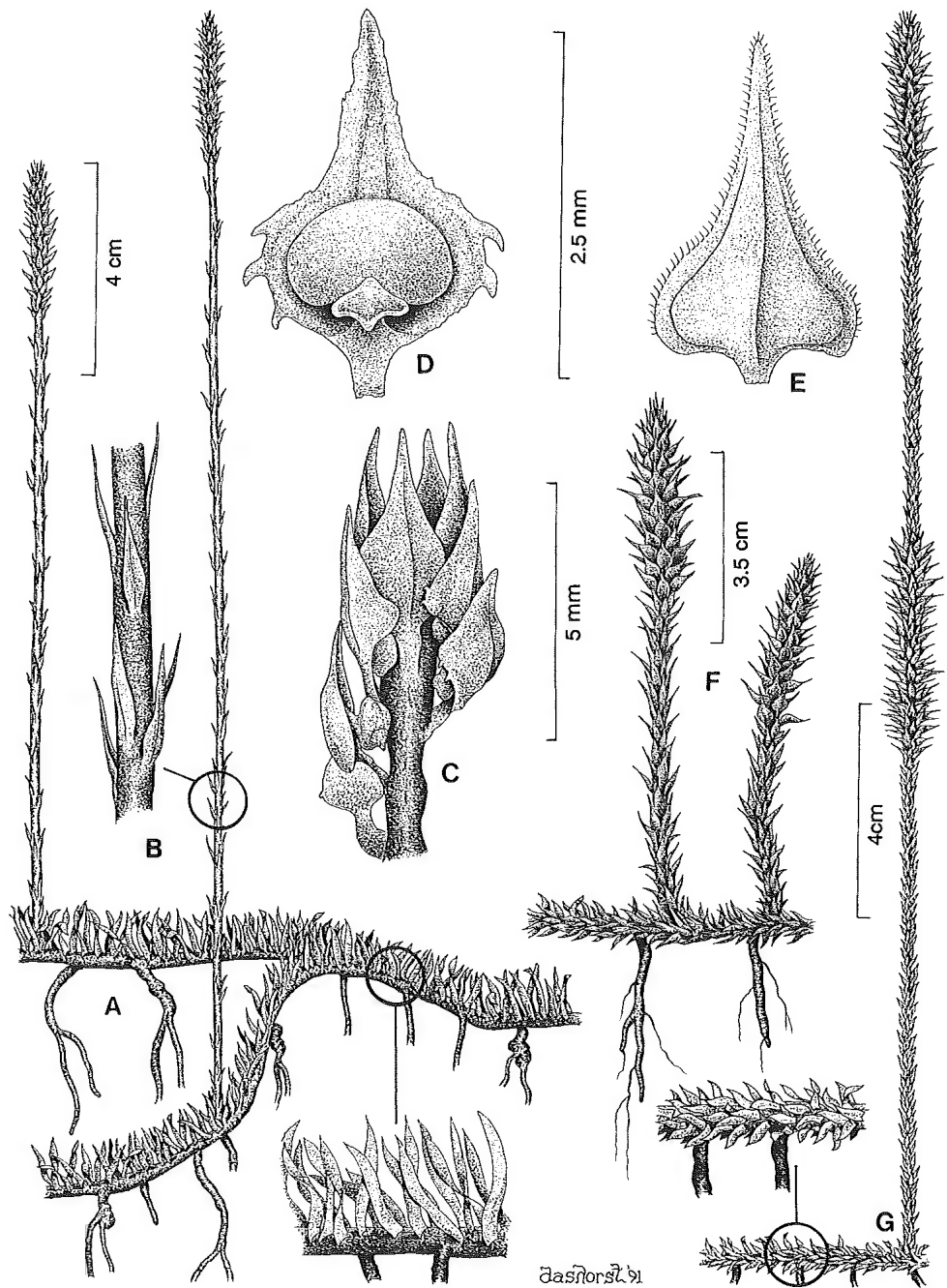


Fig. 1. *Lycopodiella limosa*: A. habit of plant with enlargement of branch showing leaves displaced away from undersurface (compare with enlargement G). B. portion of strobiliferous branch showing non-imbricate leaves. C. portion of strobilus. D. adaxial view of sporophyll showing sporangium, irregular margin and coarse teeth in basal part. *Lycopodiella serpentina*: E. abaxial view of sporophyll showing prominently ciliate margin. F. habit of plant. G. habit of plant with atypical development of the strobiliferous branch. A–D, Gray 1511; E, F, Nash AD97411267; G, Kenning, 27 Oct 1976, BRI.

3. Leaves >6 mm long, sporophyll margins non ciliate, but irregularly lacerate or toothed, leaves, on strobiliferous branches much reduced, internodes long **L. limosa**
 Leaves <4.5 mm long, sporophyll margins ciliate, leaves on strobiliferous branches similar to prostrate branches, internodes short, leaves overlapping **L. serpentina**
4. Branches prostrate, spreading, dichotomously branched; strobili erect, standing above the branches **L. diffusa**
 Branches erect, undivided or forked several times; strobili erect, overtopped by vegetative shoots **L. lateralis**

2. *Lycopodiella serpentina* (Kunze) B. Ollg.

During a study of specimens of *Lycopodiella serpentina* an atypical growth form of the strobiliferous branch was encountered. Normally the branch is terminated by a strobilus but in two collections from Queensland, one from Stradbroke Island (Kenning, 27 Oct 1976, BRI) and the other from near the Hopevale-Starke road on the track to McIvor River, north eastern Queensland (Clarkson 5332, AD, BRI), the apex of the strobili revert to the vegetative state and develop for another 8–10 cm before terminating in secondary strobili (see Fig. 1G). As far as I am aware this phenomenon has not been reported elsewhere for *Lycopodiella serpentina*.

Acknowledgements

I thank Dr G. Guymer (BRI) and Dr B. Hyland (QRS) for the loan of specimens and Mr G.R.M. Dashorst for preparing the illustrations. This work was partially funded by an Australian Biological Resources Study Grant.

Reference

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Maps 1–5. Distribution of *Lycopodiella* spp. 1. *L. limosa*. 2. *L. serpentina*. 3. *L. diffusa*. 4. *L. lateralis*. 5. *L. cernua*.

STUDIES IN AUSTRALIAN GRASSES 6*. *ALEXFLOYDIA*, *CLIFFORDIOCHLOA* AND *DALLWATSONIA*, THREE NEW PANICOID GRASS GENERA FROM EASTERN AUSTRALIA

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Summary

Three new panicoid genera, namely *Alexfloydia* from northern New South Wales, and *Cliffordiochloa* and *Dallwatsonia* from the Cook Pastoral District of Queensland, are described as new and compared with related genera of the Paniceae. New species described are *Alexfloydia repens*, *Cliffordiochloa parvispicula* and *Dallwatsonia jelliana* and details are given of their morphology and anatomy.

Introduction

A number of classifications of *Panicum* and allied genera have been proposed in the past (Chase 1908, 1911; Hitchcock & Chase 1910, 1915; Stapf 1917–1934; Hsu 1965; Butzin 1970; Brown 1977; Zuloaga & Soderstrom 1985; Clayton & Renvoize 1986; Zuloaga 1987) but a satisfactory scheme is far from appearing and depends on world-wide studies of generic limits of the Paniceae based on characters from many sources.

Three panicoid grass species, in which the spikelets are laterally compressed and the fertile lemma is membranous, have been a focus of my attention recently during an updating of my key to Australian grasses (Simon 1990). The lateral spikelet compression and the possession of a membranous upper lemma necessitates a more detailed examination of current views on the boundaries of the genus *Panicum*. Lateral compression and a non-indurate upper lemma are considered to be non-*Panicum* characters in the keys of Clayton and Renvoize (1986) and Watson and Dallwitz (1988), whereas Zuloaga and Soderstrom (1985) appear undecided whether the consistency of the upper lemma ('antheceum') was a character of generic importance in determining the classification of *Panicum aristellum*. I am of the opinion that these three species, on the basis of their laterally compressed spikelets and membranous upper lemmas, should be described as new genera. They key out unsatisfactorily in existing keys to genera (Watson & Dallwitz 1988; Clayton & Renvoize 1986; Simon 1990) so designation of distinct generic rank for them seems a rational decision. This follows on from the recent tradition of checking the credentials of suspected new grass genera using the computer identification programs ONLINE (Pankhurst & Aitchison 1975) and later INTKEY (Watson & Dallwitz 1988) on Watson's automated generic descriptions of the grass genera of the world. Examples are the genera *Cyperochloa* Lazarides & L. Watson (Lazarides & Watson 1987) and *Clausospicula* Lazarides (Lazarides, Lenz & Watson 1991). The current (1991) version of INTKEY also maintains the integrity of a number of grass genera erected since the published 1988 version, including the genera *Alvimia* Calderon ex Soderstrom & Londono, *Arundoclaytonia* Davidse & Ellis, *Euthryptochloa* Cope and *Planichloa* B. Simon. Another example of the use to which Watson's automated generic descriptions of grass genera has been put is the correct taxonomic placing of a fossil grass (Thomasson, Nelson & Zakrzewski 1986). Comments from Dr. Les Watson regarding the status of the three new panicoid genera in this paper lend further weight to the selection of generic rank for these taxa. "I've had a preliminary attempt at making diagnostic descriptions and comparisons with seeming relatives etc., via INTKEY, and my impression is that they are all defensible as genera. The problem, of course, is *Panicum*, which somewhere manifests every state of every pertinent character." The automated descriptions of Watson include complete descriptions of leaf blade anatomy under headings **Abaxial leaf blade epidermis** and **Transverse section of leaf blade, physiology, culm anatomy**. The three new genera were all subjected to the standardised anatomical sectioning at Les Watson's laboratory by his technical assistant Jill Hartley and are reported in this paper in the

*continued from Austrobaileya 3(4): 585–607 (1992)

standard format of Watson and Dallwitz (1988). Although abaxial leaf blade epidermal strips were prepared successfully and photographed for samples of all three of the new genera, a transverse section of the mid-lamina good enough for photographic reproduction was obtained only for *Alexfloydia repens*.

Alexfloydia B. Simon

This grass, known locally as Floyd's Grass, was brought to the attention of naturalists in the Coffs Harbour area of New South Wales in the late 1980s. A specimen of it had been taken by Mr Alex Floyd of the New South Wales National Parks and Wildlife Service, Coffs Harbour, to Dr Surrey Jacobs of the New South Wales National Herbarium, Sydney, in late 1987. At the time Dr Jacobs was of the opinion that the specimen belonged to an unknown genus. In 1988, logging on land east of the Pacific Highway east of Bonville, where this grass was known to occur, was stopped. This was the result of an awareness campaign by local conservationists to protect this rare grass and endangered avifauna. It is only known from three localities, two east of Bonville and one south of Boambee (A. Floyd pers. comm.). The vegetation in the two habitats from which collections have been made differs to some degree, as seen from the collector's notes below.

Material was sent to me in 1988 and I identified it as *Panicum* sp. *Floyd* 3429 in the Queensland Herbarium and in my key to Australian grasses (Simon 1990). I have since been informed by Mr Floyd that this number is not one of his collecting numbers, but as the specimen has already been cited as such it will be referred to as *Floyd* [3429]. Using INTKEY this grass keys to *Arthropogon* Nees, but it differs from that genus by its glumes not being awned. It keys to *Anthenantia* P. Beauv. in the key to genera of the Paniceae in Clayton and Renvoize (1986), but that genus has hairy spikelets rather than glabrous ones as in this taxon. It keys to couplet 209 in Simon (1990) and no further as the lower glume is two-thirds as long as the spikelet, whereas the couplet provides the choices of the lower glume being either as long as the spikelet or up to half the spikelet length or absent. In Webster (1987) it keys to couplet 25, leading to the genera *Rhynchelytrum* Nees and *Melinis* P. Beauv. – now both placed in *Melinis* (Zizka 1988) – but differs by the upper glume being 9-nerved as opposed to 5–7-nerved in the latter genera.

***Alexfloydia* B. Simon, gen. nov.**, *Panico* L. affine, sed lemmate membranaceo et spicula complanato laterali, *Arthropogo* Nees affine, sed sine glumis aristis, *Anthenantio* P. Beauv. affine, sed spicula glabro differt. **Typus:** *A. repens* B. Simon.

Plants stoloniferous, sparingly branched, terminated by a solitary inflorescence, 3–4-noded. Internodes shorter than the associated leaf sheaths. Sheaths compressed. Ligule a fringe of hairs. Leaf blades flat, linear, glabrous, smooth, with smooth margins and a prominent white midrib. Inflorescence a panicle of 3–6 spikelets and a short main axis, smooth. Pedicels not distinctly angled, smooth, straight. Disarticulation at the base of the spikelet. Callus not differentiated and not prolonged into a stipe. Spikelets adaxial (with the lower glume facing the pedicel), laterally compressed, elliptic in outline. Glumes unequal, chartaceous, smooth: lower glume ovate, 5–7-nerved, glabrous, acute; upper glume long, elliptic, 9-nerved, rounded on the back. Rachilla not pronounced between the glumes. Lower floret male, anthers 3; lemma elliptic, 9-nerved, chartaceous, glabrous, acute; palea elliptic, 2-nerved. Upper floret perfect: lemma oblong, obscurely 5-nerved, glabrous, yellow, firmly membranous or thinly cartilaginous, striate, acute; palea oblong, with texture similar to the lemma, entire, smooth. Lodicules 2, free, membranous. Anthers 3.

One species, northern New South Wales.

Etymology: The genus is named for Mr Alex Floyd, who has collected all the known material of this grass and has drawn attention to its rarity.

***Alexfloydia repens* B. Simon, sp. nov.**

Gramen stolonibus, culmis 18–24 cm altis, 3–4 nodis. Laminae foliorum laeve, 0.5–6 cm × 1–1.5 mm, marginibus laevibus, costis albis. Panícula spiculis 3–6 gerens; axis c.

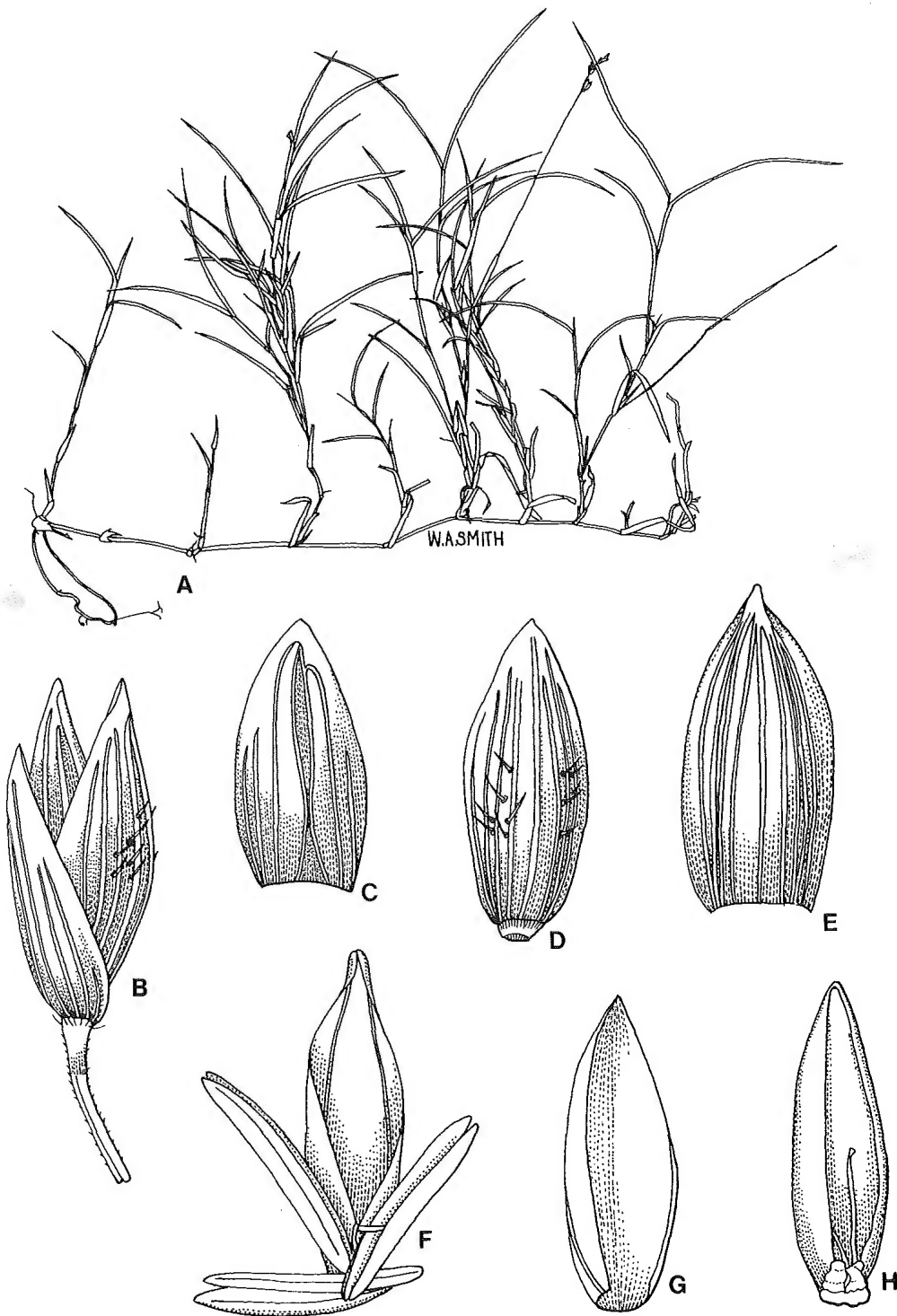


Fig.1. *Alexfloydia repens*: A. habit $\times 0.5$. B. spikelet, lateral view. C. lower glume. D. upper glume. E. lower lemma, dorsal view. F. lower palea with stamens, ventral view. G. upper lemma. H. upper palea, showing lodicules at base and stamen filaments. (B-H, all $\times 12$). From type specimen.

1.5 cm longus et laevis. Pedicelli 4–7 mm longi. Disarticulatus ad basem spiculae. Spiculae adaxiales, lateraliter complanatae, ellipticae in ambitu, $3\text{--}3.5 \times 1.5$ mm. Glumae inaequales, chartaceae, laeves: gluma infera c. 2 mm longa, ovata, 5–7-nervata, acuta; gluma supra elliptica, c. 3 mm longa, 9-nervata, rotundata in dorso, pilis tuberculatis sparsis ad medium. Flosculus inferus masculus: lemma ellipticum, 9-nervatum, chartaceum, glabrum, acutum; palea elliptica, 2-nervata, acuta. Flosculus superus perfectus, flosculus inferum longior: lemma c. 1.5 mm longa, luteum membranaceum, laeve, oblongum, acutum; palea membranacea, laevis. **Typus:** New South Wales, NORTH COAST DIVISION, Boambee, Cordwells Creek, Dutton's Estate, Portion 40, $30^{\circ}20'45''\text{S}$, $153^{\circ}04'40''\text{E}$, 7 April 1991, A.G. Floyd 2165, ground cover with some *Ottocloa gracillima*, *Gahnia clarkei* and *Fimbristylis ferruginea* in the king tide zone above *Aegiceras corniculatum* and *Avicennia marina* mangrove forest, weak soft trailing mat grass up to 20 cm tall, canopy of *Callistemon salignus* with *Parsonsia straminea* a common liane (holo: BRI(AQ 540193); iso: BRI,CANB,DNA,K,L,MEL,MO,NSW). **Fig. 1.**

Culms 18–24 cm tall. Ligule c. 0.2 mm long. Leaf blades 0.5–6 cm \times 1–2 mm. Inflorescence main axis c. 1.5 cm long. Pedicels 4–7 mm long, not distinctly angled, smooth, straight. Spikelets $3.0\text{--}3.5 \times 1.5$ mm. Glumes: lower glume c. 2 mm long, upper glume c. 3 mm long, sometimes with a few tubercle-based hairs at the mid-region. Lower floret: anthers 2.5 mm long; lemma c. 3 mm long; palea as long as the lemma. Upper floret perfect, shorter than the lower floret: lemma c. 1.5 mm long; palea as long as the lemma. Lodicules 2, c. 0.5×0.3 mm long. Anthers c. 0.8 mm long. Caryopsis not seen.

Specimens examined: New South Wales, NORTH COAST DIVISION: Boambee, Floyd 2165 (type – for details see above) (BRI,CANB,K,L,MEL,MO,NSW); Pine Creek, east of Bonville, $30^{\circ}23'15''\text{S}$, $153^{\circ}04'00''\text{E}$, understorey to tall *Casuarina glauca* forest in sub-saline semi-wetland, soft carpet with no other ground cover or shrub layer, Oct 1987, Floyd [3429] (BRI,CFSHB); Cordwells Creek, Dutton's Estate, Portion 40, $30^{\circ}20'45''\text{S}$, $153^{\circ}04'40''\text{E}$, in the king tide zone above *Aegiceras corniculatum* and *Avicennia marina* mangrove forest, Oct 1991, Floyd 2166 (AD,B,BRI,CBG,NSW,PERTH,PRE,US).

Conservation status: 2K (Briggs & Leigh 1988).

Etymology: The species is named for its creeping habit.

Notes: The spikelets of some of the specimens are insect infected, giving parts of the floret a distorted appearance.

Anatomy

Abaxial leaf blade epidermis: *Costal/intercostal zonation* conspicuous. *Papillae* absent. *Long-cells* markedly different in shape costally and intercostally, the costals much narrower; of similar wall thickness costally and intercostally (thin walled). Intercostal zones with typical long-cells. Mid-intercostal long-cells rectangular, having markedly sinuous walls. *Microhairs* present, elongated, clearly two-celled, panicoid type, 50–65 microns long, 10–15 microns wide at the septum; apical cells about 40–50 microns long; apical cell/total length ratio about 0.7–0.8; total length/width ratio at septum 3–6. *Stomata* common, 30–40 microns long; subsidiaries non-papillate, parallel sided, dome shaped and triangular (low to medium, predominantly more or less triangular with the apices truncated to various extents), including both triangular and parallel-sided forms on the same leaf; guard-cells overlapping to flush with the interstomata. *Intercostal short-cells* absent or very rare. Macrohairs infrequent, intergrading with long prickles, 1–2(–3)-celled. *Crown cells* absent. Costal zones with short cells. *Costal short-cells* conspicuously in long rows. Costal silica bodies present and well developed, 'panicoid-type', consistently elongated nodular, not sharp-pointed. **Fig. 2A & B.**

Transverse section of leaf blade, physiology, culm anatomy: C₄. Anatomical organisation conventional. XyMS-. PCR sheath outlines uneven. PCR sheath extensions absent. Mesophyll not *Isachne*-type, without 'circular cells', not traversed by colourless columns, without arm cells, without fusoids. *Leaf blade* adaxially flat. *Midrib* conspicuous (by virtue of a conspicuous abaxial keel, an arc of enlarged adaxial epidermal cells and some colourless mesophyll), with one bundle only or having complex vascularisation (depending on the interpretation of the minor bundles flanking the median), with colourless tissue adaxially (in the form of a few large cells contiguous with the bulliform epidermis). Lamina symmetrical on either side of the midrib. Bulliforms not in discrete, regular

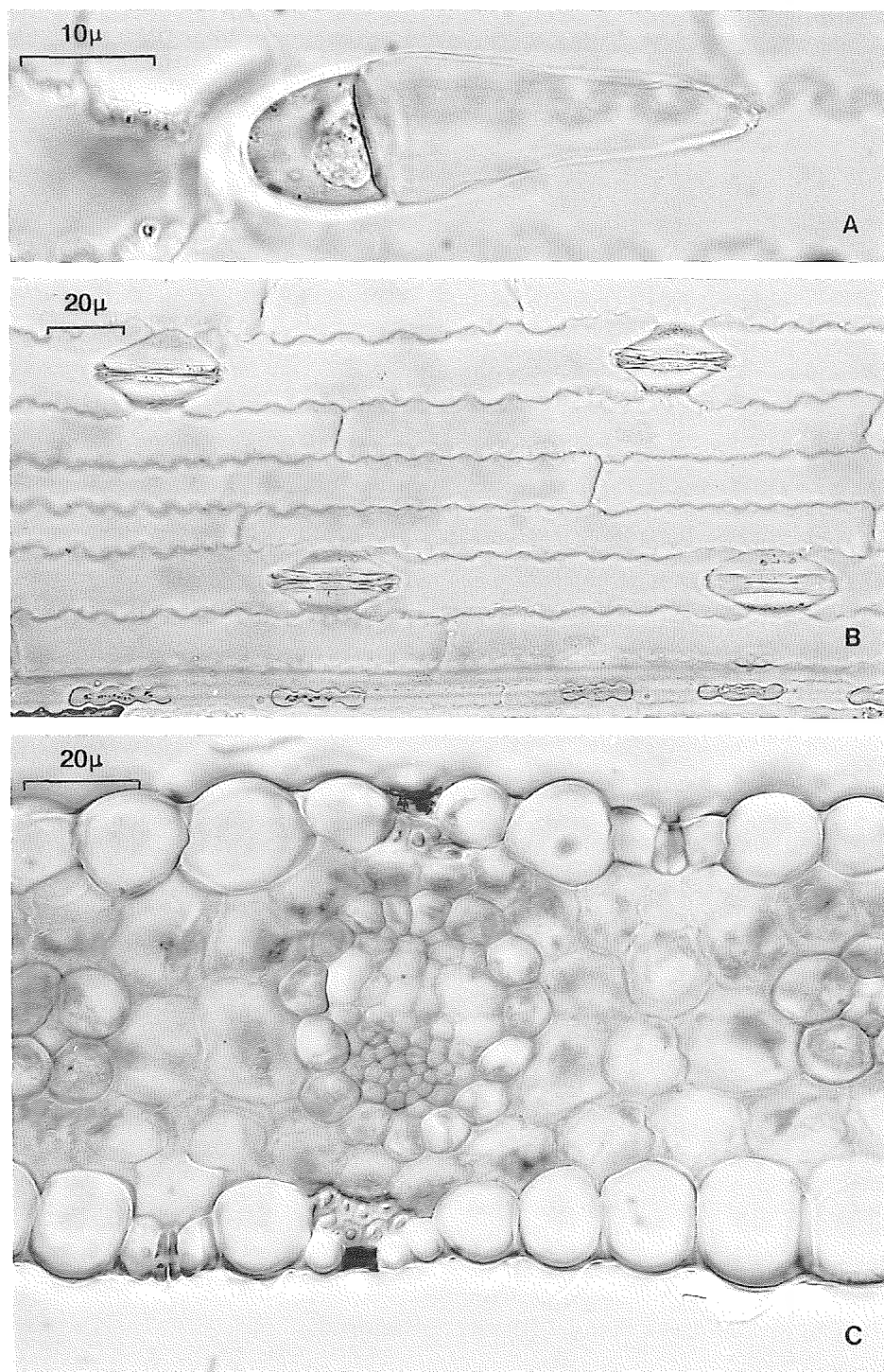


Fig. 2. *Alexfloydia repens*: A. microhair on the abaxial leaf blade epidermis. B. abaxial leaf blade epidermis. C. transverse section of part of the mid-lamina (midrib excluded). Adaxial surface uppermost.

adaxial groups (the adaxial epidermis mainly bulliform), nowhere involved in bulliform-plus-colourless cell arches. Many of the smallest vascular bundles unaccompanied by sclerenchyma. Combined sclerenchyma girders absent (the sclerenchyma restricted to a large abaxial strand in the keel and small adaxial and abaxial strands with the major laterals). Sclerenchyma all associated with vascular bundles. **Fig. 2C.**

Cliffordiochloa B. Simon

This grass has been collected only twice from the same locality in the Johnstone Shire of the Cook District of northern Queensland. It is an aquatic grass and although mentioned by the collector to be 'spreading quickly' it has not been collected outside the type locality. Using INTKEY (Watson & Dallwitz 1988) it keys to *Sacciolepis* Nash from which it differs by its spikelets not being saccate. It keys to couplet 81 in the key to genera of the Paniceae of Clayton and Renvoize (1986), leading to the genera *Arthropogon* Nees and *Reynaudia* Kunth; it differs from the former by the lower glume not being awn-like and from the latter by the lower glume not being bilobed. It keys to *Digitaria* Haller in Simon (1990) but differs from that genus by the lateral compression of the spikelet and the lower glume being at least one third the spikelet length. It keys to couplet 25 in Webster (1987), leading to *Rhynchelytrum* Nees and *Melinis* P. Beauv. in Webster (1987) but differs from them in that the spikelets are much smaller and the upper glume has fewer nerves. In Simon (1990) it was recorded as *Whiteochloa* sp. *D. Mitchell* 11, but it differs from that genus by the rachilla between the florets not being pronounced and the upper lemma being hyaline and not indurate. It is also superficially close to *Cyrtococcum* Stapf but that genus has a crested apex on the upper lemma. It differs from *Dallwatsonia* B. Simon by the upper lemma tightly enclosing the upper palea, the 1-nerved lower glume and much smaller spikelets which are distinctly paired. Finally it differs from all the above-named panicoid genera with which it has been compared, by the upper floret having only two stamens, an unusual situation in the Paniceae and only known in one other genus, *Reynaudia* Kunth from Cuba (Watson & Dallwitz 1988).

***Cliffordiochloa* B. Simon, gen. nov.,** *Whiteochloae* C.E. Hubb. affine sed sine rhachilla conspicua inter flosculos et lemmata supera hyalina, *Sacciolepi* Nash affine sed sine spicula saccata, *Digitariae* Haller affine sed gluma infera longiore, *Cyrtococco* Stapf affine sed sine apice lemmatis cristato, *Dallwatsoniae* B. Simon affine sed lemmate supero arcte paleam superam includenti arcte, eorum omnibus staminibus duobus differt. **Typus:** *C. parvispicula* B. Simon.

Weak perennial. Culms erect, tufted, sparingly branched towards apex, terminated by a solitary inflorescence, 4–6-noded. Internodes longer than the associated leaf sheaths, which are compressed. Ligule a membrane. Leaf blades flat, linear, glabrous, with smooth margins. Inflorescence a panicle with main axis, long and scabrous. Primary branches spreading, not whorled, and scabrous on the margins. Pedicels distinctly angled, scabrous, straight, with glabrous apices. Disarticulation at the base of the spikelet. Callus not differentiated. Spikelets adaxial, to 50 on a typical lowermost primary branch, laterally compressed, elliptic. Glumes unequal, membranous, glabrous: lower glume not fused with the callus, deltoid, 1 nerved, smooth, scabrous on keel; upper glume elliptic, pinched at apex, 3- sub 5-nerved, rounded on the back. Rachilla not pronounced between the glumes. Lower floret sterile; lemma elliptic, membranous, glabrous, acute and pinched at apex; palea narrowly elliptic, as long as the lemma, acute. Upper floret perfect, shorter than the lower floret, not stipitiform; lemma white, hyaline, smooth, elliptic, rounded on the back, glabrous, apically rounded; palea hyaline, smooth. Anthers 2, brownish mauve.

One species, Cook Pastoral District, Queensland.

Etymology: The genus is named for Professor H.T. (Trevor) Clifford (University of Queensland) who has done much work on classification of grass genera and who collected much of the early data on Australian genera used by Watson and Dallwitz in their computer generated keys to Australian and later world grass genera.

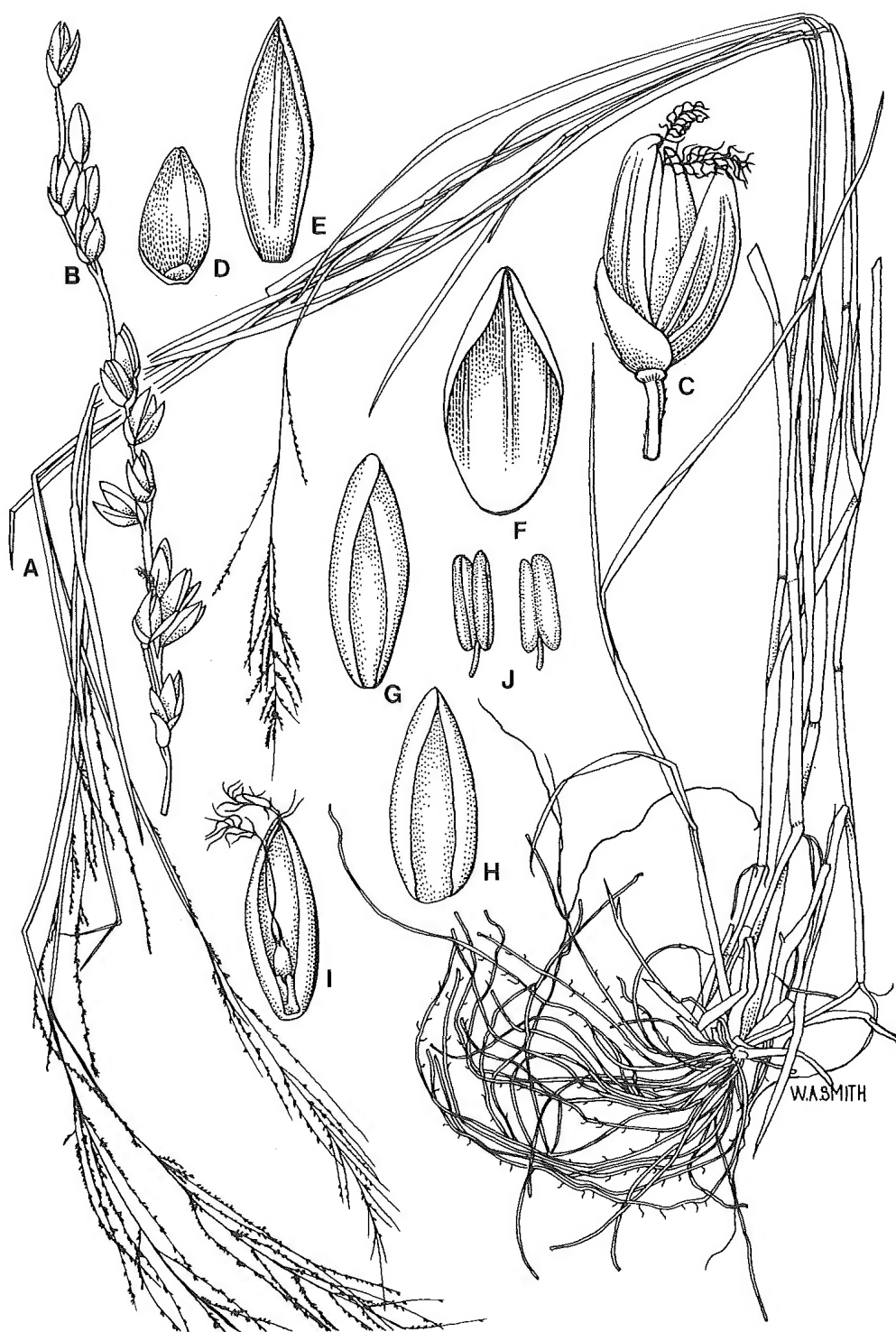


Fig. 3. *Cliffordioclhoa parvispicula*: A. habit $\times 0.5$. B. portion of panicle $\times 6$. C. spikelet, lateral view. D. lower glume. E. upper glume. F. lower lemma. G. lower palea. H. upper lemma. I. upper palea with young ovary and stigmas. J. anthers. (C-J, all $\times 25$). From type specimen.

Cliffordiochloa parvispicula B. Simon, sp. nov.

Gramen perenne infirmum. Culmi erecti, caespitosus, 60–80 cm alti, 4–6-nodi. Laminae foliorum planae, 5–15 cm × 2–3 mm, lineares, glabrae, marginibus laevibus. Axis paniculae 10–20 cm longus, scaber. Rami 4–10 cm longi. Disarticulatus ad basem spiculae. Spiculae adaxiales, lateraliter complanatae, ellipticae in ambitu, c. 1.5 × 0.5 mm. Glumae inaequales, membranaceae, glabrae: gluma infera c. 0.5 mm longa, deltata, 1-nervata, laevis, scabra in nervo: gluma supera c. 1.5 mm longa, elliptica, 3-sub 5-nervata, rotundata in dorso. Flosculus inferus sterilis: lemma ellipticum, membranaceum, glabrum, acutum; palea anduste elliptica, acuta. Flosculus superus perfectus, flosculum inferum brevior, non stipitiformis: lemma c. 1.2 mm longum, album, hyalinum, ellipticum, laeve, glabrum, rotundatum ad apicem; palea hyalina, laevis. **Typus:** Queensland. COOK DISTRICT: Mena Creek Valley, Johnstone Shire, on property of E.W. and A. Holder, Mena View, Mena Creek, 17°4'S, 145°5'E, confined to water channels, thick mat, spreading quickly, 26 January 1983, *D.J. Mitchell* 11 (holo: BRI(AQ 349007); iso: CANB). **Fig. 3.**

Culms 60–80 cm tall. Ligule c. 0.5 mm long. Leaf blades 5–15 cm × 2–3 mm. Inflorescence with main axis 10–20 cm long. Primary branches 4–10 cm long. Pedicels 0.5–1.5 mm long. Spikelets c. 1.5 × 0.5 mm. Glumes: lower glume c. 0.5 mm long; upper glume c. 1.5 mm long. Lower floret: lemma c. 1.5 mm long; palea as long as the lemma. Upper floret shorter than the lower floret; lemma c. 1.2 mm long, palea hyaline, smooth. Anthers c. 0.5 mm long. Caryopsis not seen.

Specimens examined: Queensland. COOK DISTRICT: Mena Creek, Johnstone Shire on E. Holder's Property, 17°4'S, 145°5'E, undulating foothill country, Mar 1983, *Mitchell* s.n. (BRI,CANB); *D.J. Mitchell* 11 (type – for details see above) (BRI,CANB).

Conservation status: 2K with a possibility of it being 2V as it has only been collected from the type locality (Briggs & Leigh 1988).

Etymology: The species is named for its small spikelets.

Anatomy

Abaxial leaf blade epidermis: *Costal/intercostal zonation* conspicuous. *Papillae* absent. *Long-cells* markedly different in shape costally and intercostally, the costals much narrower; of similar wall thickness costally and intercostally (the walls of medium thickness). Intercostal zones with typical long-cells. Mid-intercostal long-cells rectangular, having markedly sinuous walls. *Microhairs* present, elongated, clearly two-celled, panicoid-type, 30–45 microns long, 5–10 microns wide at the septum; apical cells 20–30 microns long. Microhair apical cell/total length ratio 0.4–0.6; total length/width ratio at septum 4–6. *Stomata* common, 20–30 microns long; subsidiaries non-papillate, low dome-shaped to triangular or parallel-sided by extreme truncation of triangles, including both triangular and parallel-sided forms on the same leaf; guard-cells overlapping to flush with the interstomata. *Intercostal short-cells* common, in cork/silica-cell pairs or many solitary, sometimes silicified. Intercostal silica bodies mostly cross shaped. *Crown cells* absent. Costal short-cells conspicuously in long rows. Costal silica bodies present and well developed, 'panicoid-type', nearly all dumb-bell shaped, not sharp pointed. **Fig. 4A.**

Transverse section of leaf blade, physiology, culm anatomy: C₃. XyMS+. Mesophyll with radiate chlorenchyma, *Isachne*-type, without 'circular cells', not traversed by colourless columns, without arm cells, without fusoids. *Midrib* conspicuous, with one bundle only or having complex vascularisation (depending on the interpretation of the midrib), without colourless tissue adaxially. *Lamina* symmetrical on either side of the midrib. Bulliforms in discrete, regular, adaxial groups, in simple fans (these large), nowhere involved in bulliform-plus-colourless cell arches. All the vascular bundles accompanied by sclerenchyma. Combined sclerenchyma girders present (with all the primary bundles, the minor bundles mostly with adaxial and abaxial strands). Sclerenchyma all associated with vascular bundles.

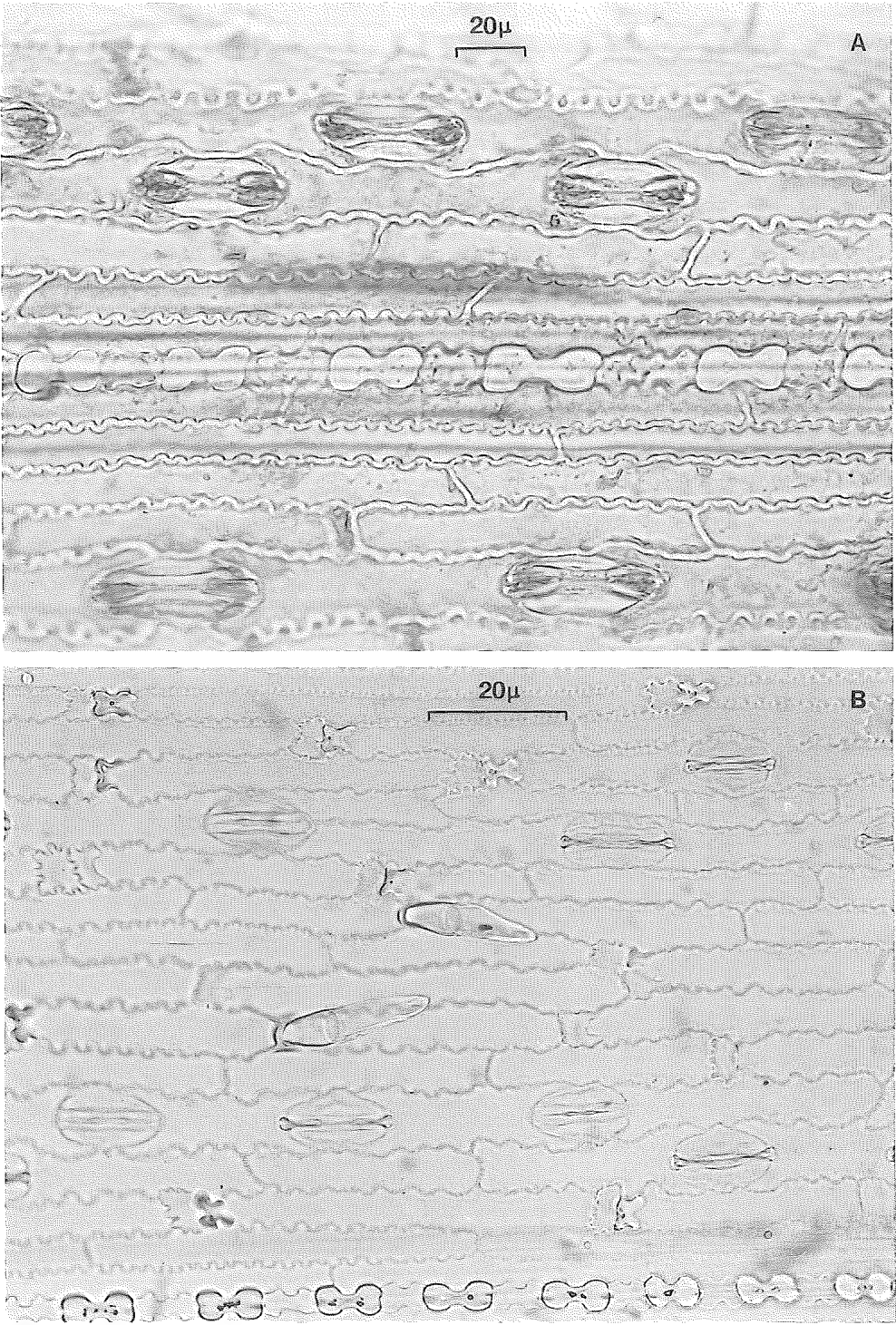


Fig. 4. A. *Cliffordiochloa parvispicula*: abaxial leaf blade epidermis. B. *Dallwatsonia felliana*: abaxial leaf blade epidermis.

Dallwatsonia B. Simon

This grass was submitted to the identification unit of the Queensland Herbarium in May 1991 and at the outset it looked different and interesting. Using INTKEY (Watson & Dallwitz 1988) it keys to *Sacciolepis* Nash from which it differs by its spikelets not being saccate. In the key to genera of the Paniceae in Clayton and Renvoize (1986) it keys to the second half of couplet 97, leading to *Anthenantia* P. Beauv., except that its upper lemma is membranous rather than "firm to the tip". Also it differs further from that genus by its spikelets being glabrous and by having a lower glume. It is also similar to *Whiteochloa* C.E. Hubb. but it differs from that genus by the rachilla between the florets not being pronounced and the upper lemma being hyaline and not indurate. It differs from *Cliffordiochloa* B. Simon by its upper lemma only loosely enclosing the upper palea, by its upper floret with 3 stamens, by its 5-nerved lower glume and its much larger spikelets which are not distinctly paired as in that genus.

Dallwatsonia B. Simon, **gen. nov.**, *Whiteochloae* C.E. Hubb. affine sed sine rhachilla inter flosculos et cum lemmatibus superis hyalinisa, *Sacciolepi* Nash affine sed sine spicula saccata, *Anthenantiae* P. Beauv. affine sed lemmate supero membranaceo, spiculato glabro, cum glumo infero, *Cliffordiochloa* B. Simon affine, sed lemmate supero paleam superam laxe includenti, gluma infera 5-nervata, staminibus tribus, spiculis multis grandioribus multis differt. **Typus:** *Dallwatsonia felliana* B. Simon.

Plants perennial. Culms erect, tall, sparingly branched, terminated by a solitary inflorescence, 7-noded. Internodes slightly longer than the associated leaf sheaths, which are keeled. Ligule a fringed membrane with the fringe extremely short, entire. Leaf blades flat, linear-lanceolate, glabrous, with smooth margins. Inflorescence a panicle, scaberulous. Primary branches spreading, not all whorled, scaberulous on the margins. Pedicels 0.1–4.0 mm long, not distinctly angled, scabrous, straight with apices glabrous. Disarticulation at the base of the spikelet. Callus not differentiated, not prolonged into a stipe. Spikelets adaxial, c. 35 on a typical lowermost primary branch, laterally compressed, lanceolate, single or indistinctly paired. Glumes unequal, membranous, glabrous: lower glume ovate, 5-nerved, smooth, rounded on the back; upper glume lanceolate, 6–7-nerved, rounded on the back, slightly pinched at apex. Rachilla slightly pronounced between the glumes. Lower floret sterile; lemma lanceolate, membranous, glabrous, acute and slightly pinched at apex; palea a narrow, linear membrane. Upper floret perfect, slightly shorter than or the same length as the lower floret, not stipitiform: lemma long, white, membranous, smooth, lanceolate, rounded on the back, glabrous, acute; palea membranous, smooth. Lodicules very small. Anthers 3.

One species, Cook District, Queensland.

Etymology: The genus is named for Dr Mike J. Dallwitz, Division of Entomology, CSIRO, who has pioneered the DELTA system (Dallwitz & Paine 1988), used worldwide in the taxonomic study of many biological groups, and Dr Leslie Watson, Taxonomy Laboratory, Research School of Biological Sciences, Australian National University, who, with Dallwitz, has used DELTA extensively in preparing automated descriptions and keys to grass genera of the world (Watson 1987; Watson & Dallwitz 1988) and who has encouraged many other people to use DELTA for the study of grass species. The INTKEY version of DELTA assisted greatly in the analysis of the three new genera in this paper.

Dallwatsonia felliana B. Simon, **sp. nov.**

Gramen perenne. Culmi erecti, ad 130 cm alti, c. 7-nodi. Laminae foliorum planae lineares-lanceolatae, 15–30 cm × 3.5–7.0 mm, glabrae, marginibus laevibus. Axis paniculae ad 22 cm longus, scaberulus, ramis 4–10 cm longis, marginibus scaberulis. Disarticulatus ad basem spiculae. Spiculae adaxiales, lateraliter complanatae, lanceolatae, 3.5–4.0 × 1.5 mm. Glumae inaequales, membranaceae, glabrae: gluma infera 1.0–1.5 mm longa, ovata, 5-nervata, laevis, rotundata in dorso; gluma supera lanceolata, c. 3.5 mm longa, 6–7-nervata, rotundata in dorso. Flosculus inferus sterilis: lemma lanceolatum, c. 3.5 mm longum, membranaceum, glabrum, acutum; palea anguste, linearis, c. 2 mm longa, membranacea. Flosculus superus perfectus flosculum inferum aequans vel brevior, non stipitiformis: lemma lanceolatum, c. 3.5 mm longum, album, membranaceum, laeve,



Fig. 5. *Dallwatsonia felliana*: A. habit $\times 0.33$. B. portion of panicle $\times 3$. C. spikelet, lateral view. D. lower glume. E. upper glume, dorsal view. F, G. lower lemma, ventral and dorsal views respectively. H. lower palea. I. upper lemma. J. upper palea. K. young ovary and stigmas. (C–L, all $\times 12.5$). From type specimen.

glabrum, rotundatum in dorso, acutum; palea membranacea, laevis. **Typus:** Queensland. COOK DISTRICT: Rokeby National Park, Langi Lagoon, 25 km N of Ranger Station, 13°27'S, 142°41'E, 30 April 1991, fringe and bank of a permanent freshwater lagoon, an occasional grass to 1 m growing in 10 cm of water, *D.G. Fell* 2295 (holo: BRI(AQ 540192); iso: CANB,K). **Fig. 5.**

Culms to 130 cm tall. Ligule c. 0.5 mm long. Leaf blades 15–30 cm × 3.5–7.0 mm. Inflorescence with main axis to 22 cm long. Primary branches to 6 cm long. Pedicels 0.1–4.0 mm long. Spikelets 3.5–4.0 × 1.5 mm. Glumes unequal: lower glume 1.0–1.5 mm long; upper glume c. 3.5 mm long. Lower floret: lemma 3.5 mm long; palea c. 2 mm long. Upper floret slightly shorter than or the same length as the lower floret; lemma c. 3.5 mm long. Lodicules very small. Anthers c. 1.5 mm long. Caryopsis not seen.

Specimen examined: Queensland. COOK DISTRICT: *Fell* 2295 (type – for details see above).

Conservation status: 1K (Briggs & Leigh 1988).

Etymology: The species is named for David Fell, Queensland National Parks and Wildlife Service, Cairns, who collected the type specimen, the only material of it known so far.

Anatomy

Abaxial leaf blade epidermis: *Costal/intercostal zonation* conspicuous. *Papillae* absent. *Long-cells* markedly different in shape costally and intercostally, the costals much narrower; of similar wall thickness costally and intercostally (the walls of medium thickness). Intercostal zones with typical long-cells. Mid-intercostal long-cells rectangular, having markedly sinuous walls. *Microhairs* present, elongated, clearly two celled, panicoid-type (broad, almost balaniform), 30–45 microns long, 8–10 microns wide at the septum; apical cells 25–30 microns long; apical cell/total length ratio about 0.7–1.0; total length/width ratio at septum 5.0–5.5. *Stomata* common, 25–35 microns long; subsidiaries non-papillate, dome-shaped and triangular; guard-cells overlapping to flush with the interstomata. *Intercostal short-cells* common, in cork/silica-cell pairs (mostly), or some solitary, sometimes silicified. Intercostal silica bodies mostly more or less cross shaped, with a few small intercostal prickles. *Crown cells* absent. Costal zones with short-cells. *Costal short-cells* conspicuously in long rows. Costal silica bodies present and well developed, 'panicoid-type', short to medium dumb-bell shaped or nodular (a few only), not sharp-pointed. **Fig. 4B.**

Transverse section of leaf blade, physiology, culm anatomy: C₃. XyMS+. Mesophyll seemingly *Isachne*-type in places, without 'circular cells', not traversed by colourless columns, without arm cells, without fusoids (but most of the intercostal zones with a well defined aerenchymatous region in the middle). *Leaf blade* 'nodular' in section to adaxially flat. *Midrib* conspicuous (the keel large and abaxially prominent), having a conventional arc of bundles only (the large median accompanied on either side by several small laterals), with colourless tissue adaxially. *Lamina* symmetrical on either side of the midrib. Bulliforms in discrete, regular adaxial groups, in simple fans, nowhere involved in bulliform-plus-colourless cell arches. All the vascular bundles accompanied by sclerenchyma. Combined sclerenchyma girders present (with all or most of the lateral bundles), forming 'figures' (some of the configurations somewhat I-shaped). Sclerenchyma all associated with vascular bundles.

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REVIEW OF THE GENUS *OLDENLANDIA* L. (RUBIACEAE) AND RELATED GENERA IN AUSTRALIA

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Summary

Australian Rubiaceae previously referred to *Oldenlandia* and/or *Hedyotis* and *Synaptantha* are referred to *Oldenlandia*, *Synaptantha*, *Kohautia* and *Hedyotis*. Keys to recognized genera and species are given. Twenty species of *Oldenlandia*, two species of *Synaptantha* and four species of *Hedyotis* are recorded for Australia. Two new species, *Oldenlandia kochiae* and *O. spathulata*, one new subspecies, *O. mitrasacmoides* subsp. *nigricans*, and one new variety, *Synaptantha tillaeacea* var. *hispidula* are diagnosed and described. *Oldenlandia leptocaulis*, *O. laceyi*, *O. largiflorens*, *O. thysanota*, *O. delicata*, *O. argillacea*, *O. mitrasacmoides* subsp. *trachymenoides* and *Synaptantha scleranthoides* are new combinations based on *Hedyotis leptocaulis* Halford, *H. laceyi* Halford, *H. largiflorens* Halford, *H. thysanota* Halford, *H. delicata* Halford, *H. argillacea* Halford, *H. trachymenoides* F. Muell. and *H. scleranthoides* F. Muell. respectively. Lectotypes are designated for *Hedyotis galioides*, *H. polyclada*, *H. coerulescens*, *H. mitrasacmoides*, *H. trachymenoides* and *Synaptantha tillaeacea*.

Introduction

Oldenlandia L., in the Rubiaceae tribe Hedyotideae Cham. & Schlecht., occurs throughout the tropical and warm subtropical regions of the world, with its largest diversity in Africa. Estimates of 100 (Verdcourt 1976) to 300 (Mabberley 1989) species have been made for the genus worldwide, with the lower estimate probably closer to the actual number recognizable.

There has been confusion over the delimitation of *Oldenlandia* L. and *Hedyotis* L. ever since they were described by Linnaeus in his 'Species Plantarum' (1753). Linnaeus included four species in *Oldenlandia*, namely *O. uniflora*, *O. umbellata*, *O. biflora* and *O. corymbosa*, and its name was later lectotypified by Hitchcock (1929) by *O. corymbosa*. *Hedyotis* included three species, namely *H. auricularia*, *H. fruticosa* and *H. herbacea*, and its name was later lectotypified by Chamisso and Schlechtendal (1829) by *H. auricularia*. Although *H. auricularia* is one of the species Linnaeus listed under *Hedyotis* in his first edition of 'Species Plantarum', Bremekamp (1939, 1952) queried the selection of the type of *H. auricularia* as lectotype because Linnaeus described the fruit of *Hedyotis* as dehiscent and the fruits of this species are indehiscent. Bremekamp proposed the replacement of *H. auricularia* with *H. fruticosa* as type as the latter is the only species described by Linnaeus fitting the generic description of *Hedyotis* in his 'Genera Plantarum' (1754). Bullock (1958) agreed with this decision. This relectotypification of *Hedyotis* was not accepted by Fosberg (1943), Rogers (1987) or Smith and Darwin (1988). However Fosberg and Sachet (1991) have more recently accepted Bremekamp's relectotypification. Although this matter cannot be considered resolved I will accept Bremekamp's choice of *H. fruticosa*.

The early taxonomic literature regarding these closely related genera has been reviewed by Fosberg (1943), Bremekamp (1952) and Rogers (1987).

Australian History

The treatment of *Oldenlandia* and related genera has varied considerably in the various floras of Australia as it has in other parts of the world. The first record of *Hedyotis* in Australia was in Mueller's Fragmenta (1863) where he described seven new species. Benthams (1866) listed nine species of *Hedyotis* for Australia. One of these, *H. auricularia*, was described from Indian material, another was described as a new species, *H. elatinoides*, based on a specimen of Drummond's from Western Australia, while the rest were the species from Mueller's earlier work. Benthams commented that he had initially considered that there were sufficient characters to distinguish *Oldenlandia* from *Hedyotis*. However, he considered the Australian species to be somewhat intermediate between these two genera and followed Torrey and Gray (1841) and Wight and Arnott (1834) in accepting the broader concept of *Hedyotis*.

The species previously treated by Bentham under the name *Hedyotis* were referred by Hooker (1873) to *Synaptantha*, *Oldenlandia*, *Hedyotis* or *Anotis* although none of the necessary new combinations were formally made for them. *Synaptantha* was circumscribed as a new genus to include *H. tillaeacea* F. Muell. He distinguished it by its 3/4 superior capsule and its marcescent rotate corolla together with the persistent staminal filaments. He retained *H. auricularia* under *Hedyotis* and placed *H. galioides* F. Muell. and *H. scleranthoides* F. Muell. under *Oldenlandia*. Those Australian species with dorsiventrally flattened seeds (*H. trachymenoides* F. Muell., *H. mitrasacmoides* F. Muell. and *H. pterospora* F. Muell.) were placed in the genus *Anotis*.

Mueller (1874, 1876) described another three new species of *Hedyotis* for Australia. Later Mueller (1882) transferred all Australian species of *Hedyotis* to *Oldenlandia*, probably believing this to be the correct name for the aggregate genus. Bailey (1900) recognized *Synaptantha*, *Oldenlandia* and *Hedyotis* for Queensland though the characters he used to distinguish between *Oldenlandia* and *Hedyotis* are not clear. More recently, Schwarz (1927) described two new species of *Oldenlandia*, *O. tenuissima* and *O. molugoides*, from the Northern Territory. Domin (1929) followed Hooker (1873) and made two new combinations in *Anotis*, and incorrectly attributed others in *Anotis* to Hooker (1873). Recent regional floras (Marsden 1981; Stanley & Ross 1986) have recognized the monotypic genus *Synaptantha* and *Hedyotis* in the broad sense.

Generic delimitation

There have been a number of regional studies outside Australia which have examined the relationship of *Oldenlandia*, *Hedyotis* and closely related genera within their regions. Unfortunately there has been disagreement about the resultant generic delimitations. Fosberg (1943) and Fosberg and Sachet (1991) considering the Micronesian and Polynesian taxa, and Lewis (1961, 1962) considering the North American taxa, adopted a broad concept of *Hedyotis* merging several closely related genera, including *Oldenlandia*, with it. They concluded that characteristics of the seed, flower and fruit that had been traditionally used to delimit the genera were inconsistent within taxa and of minor diagnostic significance. They maintained *Oldenlandia* as a subgenus of *Hedyotis*. More recent work on North American taxa by Terrell (1975, 1990, 1991) and Terrell and Lewis (1990) concluded that there were fundamental differences in habit and morphology of inflorescence, flower, capsule and seed together with cytological evidence that supports maintaining the genera as distinct.

In his revision of the African species of *Oldenlandia*, Bremekamp (1952) took a narrow view of the genus, maintaining *Oldenlandia* as separate from *Hedyotis* and describing a number of smaller genera. He considered the genus *Hedyotis* to be a distinct Asian taxon based on *H. fruticosa*. Lewis (1965) and Verdcourt (1976) considered some of Bremekamp's segregate genera not worthy of recognition and adopted a more conservative treatment of the tribe Hedyotideae while retaining a number of the palynologically and morphologically distinct genera including *Oldenlandia* and *Hedyotis*.

Recently Maheswari Devi and Krishnam Raju (1990) reported on the embryological features of eight species from four sections of *Hedyotis* as treated by Wight and Arnott (1834). Within their concept of the genus *Hedyotis*, Wight and Arnott (1834) combine a number of closely related genera including *Oldenlandia*. Maheswari Devi and Krishnam Raju concluded that the broad generic concept of Wight and Arnott was not supported by their data. They considered that section *Diplophragma*, which includes *H. fruticosa*, the type of *Hedyotis*, should be retained as distinct genus from the other sections of *Hedyotis sensu* Wight and Arnott.

As pointed out by a number of workers (e.g. Verdcourt 1976; Terrell 1975), the genus *Hedyotis*, when treated in the broad sense, is very polymorphic and cumbersome. I believe there is sufficient morphological and embryological evidence to indicate that the merging of these closely allied taxa into one very large genus is not warranted. It is more desirable, especially in reference to the Australian material, to recognize a number of narrowly circumscribed genera most of which are well defined and easily recognizable. However, applying the generic limits used for *Oldenlandia* in African and American accounts (Bremekamp 1952; Terrell 1990) to the Australian material would require at least two additional genera to be established to accommodate the variation in the

presently-known species. I believe it is premature to describe new genera before a more complete assessment of relationships of the Australian taxa to the Asian taxa is made. In this treatment I have taken a broader view of the genus *Oldenlandia* than that used by Bremekamp (1952) and Terrell (1990). But even so, the Australian species previously included in the genus *Hedyotis* are still separable into four genera namely *Oldenlandia* L., *Synaptantha* J.D. Hook., *Exallage* Bremek. and *Kohautia* Cham. and Schlecht.

The genera of Hedyotideae in Australia may be distinguished using the following key.

1. Fruit cartilaginous splitting septically into 2 indehiscent cocci
or indehiscent **Hedyotis**
Fruit thin walled, crustaceous, loculicidally dehiscent, sometimes splitting
septically but only above persistent calyx lobes and never into two
indehiscent cocci 2
2. Flowers 5-merous; fruit mitriform; flowers in terminal compact corymbiform
cymes **Ophiorrhiza**
Flowers 4-merous; fruit not mitriform; flowers in terminal or axillary, lax,
paniculiform or corymbiform cymes, sometimes in fascicles or solitary
at nodes 3
3. Corolla tube less than 0.3 mm long; corolla often persistent on fruit; fruit
1/2 to 2/3 superior **Synaptantha**
Corolla tube more than 0.5 mm long; corolla not persistent on fruit; fruit
no more than half superior 4
4. Corolla tube cylindrical with two distinct widths; anthers and stigma
included, the latter always overtopped by anthers; anthers inserted in
top of tube; flowers isostylous **Kohautia**
Corolla tube cylindrical with only one distinct width or funnel-shaped;
anthers and/or stigma exserted or if both included then anthers over-
topped by the stigma; flowers isostylous, heterostylous or
protandrous **Oldenlandia**

The genera *Kohautia* and *Ophiorrhiza* have been treated by Halford (1991a & 1991b respectively).

Materials and Methods

Descriptions have been prepared from dried herbarium specimens or material preserved in a 70% alcohol, glycerol and water mixture. Herbarium holdings of Australian material at AD, BRI, CANB, DNA, K (collected prior to 1927), MEL, NSW, PERTH and QRS have been examined. Selected material of non-Australian taxa from Africa, India and Malesia from K and L was also examined. All taxa dealt with here except for *O. crouchiana*, *O. polyclada*, *O. pterospora*, *O. tenelliflora* var. *papuana* and *Hedyotis novoguineensis* have also been observed in the field. The conservation status of each taxon has been coded using the criteria of Briggs and Leigh (1988). All material cited has been seen unless otherwise stated.

Terms used to describe the various parts of flowers, fruit or seed are here defined.

Beak: That portion of the capsule above the insertion of the persistent calyx lobes.

Calyx-tube: Refers to that part of the calyx fused to the ovary.

Geniculate corolla lobes: At anthesis the corolla lobes are erect in the lower part spreading perpendicularly only some distance from the base of the lobes. At the knee (the bend) there is a transverse line of dense short soft hairs.

Obloid: Three dimensional shape; a parallelepiped (i.e. brickshape) with rounded corners and edges. (Marchant *et al.* 1987)

Oldenlandia

Oldenlandia L., Sp. pl. 1: 119 (1753), Gen. pl., ed. 5, 55 (1754). **Type:** *Oldenlandia corymbosa* L.

Hedyotis L. sensu Benth., Fl. Austral. 3: 403–406 (1866), in part.

Annual herbs or rarely herbaceous perennials; stems erect, procumbent or rarely prostrate. Leaves opposite, entire, sessile or shortly petiolate. Stipules interpetiolar, adnate to leaf-bases, membranous, mostly produced into triangular lobes; margins usually fimbriate. Flowers in terminal or axillary, lax, paniculiform or corymbiform cymes, sometimes in fascicles or solitary at node. Flowers small, 4-merous, protandrous, isostylous (or heterostylous – not in Australia). Calyx-tube turbinate, globose or obloid, rarely ribbed; lobes distinct, sometimes joined at base into a short free tube. Corolla white, pale mauve, blue or pink, hypocrateriform or narrowly infundibular; lobes valvate. Stamens with filaments attached on corolla tube at or below sinus between corolla lobes. Anthers dorsifixed. Ovary 2 locular, 4/5 to 9/10 inferior; ovules 2 to numerous on fleshy, globose or obloid placentas. Placenta peltately attached centrally or near base of septum by short stalk. Style terete or filiform; stigma mostly bifid, sometimes capitate, rarely conical. Capsule crustaceous, with loculicidally dehiscent beak. Seeds mostly numerous, obconic, truncate obconoidal, meniscoid, scutelliform, cerebriform or obovoid, sometimes becoming mucilaginous when moistened; surface variously patterned.

Distribution: In Australia the genus occurs predominantly north of the Tropic of Capricorn, with several species extending down the east coast to the Moreton District, Queensland, and two species occurring in the southern regions of the Northern Territory. Twenty species occur in Australia; 19 species are native, of which 14 are endemic, and 1 is introduced.

No attempt has been made in this paper to place the Australian taxa of *Oldenlandia* into a infrageneric classification. However, it is possible to distinguish in them five groupings based mostly on seed morphology. The relationships between these groupings and their relationship to the infrageneric classification developed by Bremekamp (1952) for the African *Oldenlandia* have not been determined.

Group 1. *O. corymbosa*, *O. polyclada*, *O. tenuifolia*, *O. subulata*, *O. galioides*, *O. tenelliflora* and *O. kochiae*. Flowers isostylous. Seeds obconic to depressed obconic, mostly slightly laterally compressed, obdeltate to shallowly obtriangular in outline, becoming mucilaginous when moistened; hilum near centre of ventral surface; surface reticulate or reticulate-areolate. **Fig. 1A.**

Group 2. *O. mitrasacmoides* and *O. pterospora*. Flowers isostylous. Seeds meniscoid or scutelliform, oblong or broadly elliptic in outline, becoming mucilaginous when moistened; hilum situated on a conspicuous central ridge; surface reticulate-areolate or reticulate-foveate. **Fig. 1B–D.**

Group 3. *O. crouchiana*, *O. spermacocoides*, *O. spathulata* and *O. biflora*. Flowers isostylous. Seeds cerebriform or transversely ellipsoidal, transversely elliptic, depressed ovate or depressed obovate in outline; not becoming mucilaginous when moistened; hilum near centre of ventral surface on seed; surface reticulate-foveate or scrobiculate. **Fig. 1E–G.** The first three species appear to be more closely related to one another than to *O. biflora*.

Group 4. *O. leptocaulis*, *O. delicata*, *O. laceyi*, *O. thysanota* and *O. largiflorens*. Flowers protandrous. Seeds truncate obconoidal, irregular in outline, not becoming mucilaginous when moistened; hilum near centre of ventral surface in shallow depression; surface reticulate-foveate. **Fig. 1H.** A natural group quite distinct from the remainder of the Australian *Oldenlandia*. Preliminary investigations of pollen show that they have 6- to 9-colporate pollen distinct from the rest of the Australian *Oldenlandia* whose pollen is 3- or 4-colporate.

Group 5. *O. argillacea* and *O. coerulescens*. The position of these species appears somewhat uncertain. Their habit, floral and fruit morphology reveal that these two species are closely related. However, seed morphology would place them in Groups 1 and 2 respectively.

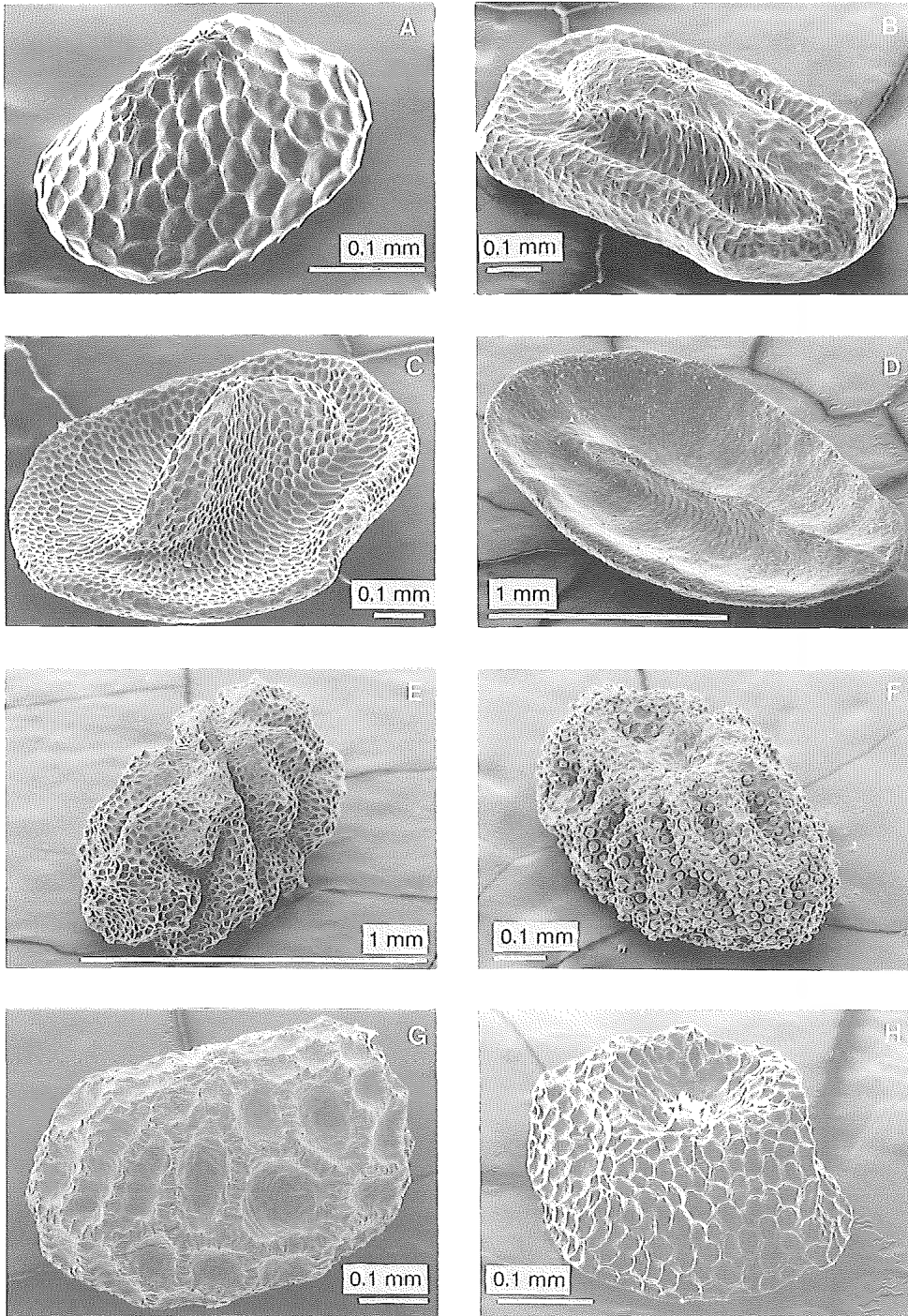


Fig. 1. Scanning electron micrographs of *Oldenlandia* seeds (oblique adaxial view). A. *O. galiooides* (Halford H147). B. *O. mitrasacmoides* subsp. *mitrasacmoides* (Halford H19). C. *O. mitrasacmoides* subsp. *trachymenoides* (Halford H3). D. *O. pterospora* (Nelson 6). E. *O. spermacocoides* (Byrnes 715). F. *O. spathulata* (Halford Q466). G. *O. biflora* (Sharpe et al. 4475). H. *O. laceyi* (Halford H72).

Key to Australian species of *Oldenlandia*

1. Corolla lobes geniculate with a line of hairs at knee only 2
Corolla lobes spreading from base, straight or evenly recurved with hairs
present or absent at base of corolla lobes 6
2. Capsule subglobose or turbinate-obovoid, not markedly longer than broad 3
Capsule obloid or obloid-ellipsoidal, markedly longer than broad 4
3. Flowers in subsessile fascicles; leaves linear, narrow elliptic or oblanceolate, 15–35 mm long, 1–8 mm wide. WA, NT **12. O. spermacocoides**
Flowers in pedunculate lax cymes; peduncles 1–3 cm long; leaves elliptic or oblong-elliptic, 15–60 mm long, 5–20 mm wide. Qld **1. O. biflora**
4. Herbs to 20 cm tall; branchlets stout, tetragonous or tetraquetrous; corolla with tube 1.0–1.5 mm long and lobes 3.0–6.5 mm long; capsule obloid, 3.5–6.0 mm long, 3.5–4.5 mm wide; seeds cerebriform. WA **10. O. crouchiana**
Herbs to 40 cm tall; branchlets terete or obtusely 4-angled, somewhat tetragonous when young; corolla with tube 0.5–1.0 mm long and lobes 2.0–4.5 mm long; capsule ellipsoidal or obloid-ellipsoidal, 2.5–5.0 mm long, 1.5–3.0 mm wide; seeds obconic or somewhat scutelliform 5
5. Seeds depressed obconic, shallowly obtriangular in outline; hilum near centre of ventral surface. WA, NT, Qld **8. O. argillacea**
Seeds somewhat scutelliform, broadly elliptic in outline; hilum on longitudinal ridge on ventral surface. Qld **9. O. coerulescens**
6. Throat of corolla tube densely bearded or with a distinct line of hairs at base of corolla lobes 7
Throat of corolla tube glabrous or tube internally hairy without distinct line of hairs at throat 11
7. Seeds scutelliform; hilum on longitudinal ridge on ventral surface 8
Seeds cerebriform, obconic or truncate obconoidal, never scutelliform; hilum near centre of ventral surface 9
8. Flowers on unequal, stout pedicels; capsule depressed obovoid, deeply furrowed along dissepiment; beak emarginate; ovules 2 to 6 per locule. WA, NT **15. O. pterospora**
Flowers on ± equal, slender pedicels; capsule subglobose, ovoid-globose or depressed obovoid, slightly furrowed at dissepiment; beak rounded or truncate; ovules more than 10 per locule. WA, NT, Qld **14. O. mitrasacmoides**
9. Corolla tube less than 2 mm long 10
Corolla tube longer than 3 mm. NT **19. O. thysanota**
10. Prostrate or decumbent herbs, occasionally forming a mat; flowers axillary, either solitary or in 2- to 7-flowered umbel-like corymbs. WA, NT, Qld **2. O. corymbosa**
Weakly ascending herbs; flowers terminal, in irregular dichasially branched cymes. WA **13. O. kochiae**
11. Flowers in lax terminal cymes 12
Flowers axillary, either solitary or in subsessile or pedicellate fascicles 16
12. Capsule obloid-ellipsoidal, 5–10 mm long; corolla lobes spatulate, 6–8 mm long. Qld **11. O. spatulata**
Capsule globose to subglobose, less than 4 mm diameter; corolla lobes 1–4 mm long 13

13. Decumbent herbs; branchlets rooting at nodes; flowers not protandrous; seeds obconic, laterally compressed. Qld **5. *O. subulata***
 Erect or ascending herbs; branchlets not rooting at nodes; flowers protandrous; seeds truncate obconoidal 14
14. Plants to 50 cm tall; leaves to 6 cm long; corolla tube longer than 6 mm; capsule 2–3 mm diameter. WA, NT **16. *O. largiflorens***
 Plants to 30 cm tall; leaves 1–4 cm long; corolla tube less than 5 mm long or if longer then the capsule 1.5–2.0 mm diameter 15
15. Corolla infundibuliform; staminal filaments 0.5–1.0 mm long; calyx lobes 0.5–1.5 mm long. NT **18. *O. leptocaulis***
 Corolla hypocrateriform; staminal filaments 0.2–0.5 mm long; calyx lobes 0.5–1 mm long. WA, NT, Qld **17. *O. lacey***
16. Flowers solitary in leaf axils or if more than one, with rudiments of a branchlet between them; leaf apex acute, never with mucro 17
 Flowers in subsessile axillary or terminal fascicles or if solitary then leaf apex mucronate 20
17. Indumentum on stems and leaves retrorse. WA **20. *O. delicata***
 Indumentum, if present, on stems and leaves erect or antrorse 18
18. Capsule subglobose, 2.5–3.5 mm diameter; beak broad, calyx lobes 2–3 mm long; corolla infundibular to campanulate with tube 1.5–3.5 mm long. Qld 19
 Capsule ovoid-globose, 1.5–3.0 × 1.0–3.0 mm, slightly compressed; beak narrow; calyx lobes 1.0–1.5 mm long; corolla tubular to narrow infundibular with tube 0.5–1.5 mm long. WA, NT, Qld. **3. *O. galioides***
19. Pedicels slender, 6–25 mm long, papillose. Qld **5. *O. subulata***
 Pedicels stout, 2–10 mm long, glabrous. NT, Qld **4. *O. tenuifolia***
20. Low spreading herbaceous perennial; stems much branched, becoming woody with age; flowers terminal in fascicles of 2–8 or solitary; pedicels 3–6 mm long. Qld **6. *O. polyclada***
 Procumbent annual; stems sparingly branched; flowers axillary in subsessile cymes; pedicels to 1 mm long. Qld **7. *O. tenelliflora* var. *papuana***
- 1. *Oldenlandia biflora* L.** Sp. pl. 1: 119 (1753); *Hedyotis biflora* (L.) Lam., Encycl. 1: 272 (1791); *Thecagonum biflorum* (L.) Babu, Bull. Bot. Surv. India 11: 213–214 (1969). **Type:** Ceylon, *Hermann* (holo: BM, photo BRI).
Hedyotis racemosa Lam., Encycl. 3: 80 (1789). **Type:** *Sonnerat* s.n. (holo: P-LA, microfiche BRI).

Spreading prostrate to decumbent annual herbs; divaricately branched; branchlets stout, obtusely 4-angled, glabrous sometimes scabridulous along ribs. Leaves elliptic to narrow elliptic or oblong-elliptic, 15–60 mm long, 5–20 mm wide, somewhat succulent, scabridulous along margin and midvein above, glabrous below, attenuate at base, obtuse or acute at apex; petiole 1–3 mm long, sometimes scabridulous. Stipule-sheath 2–3 mm long, glabrous or sparsely pubescent, produced into triangular lobe; margin fimbriate. Inflorescences terminal or axillary, few-flowered cymes; peduncles 10–30 mm long; pedicels 5–10 mm long; bracts subulate or oblong, 1–4 mm long. Calyx-tube turbinate, somewhat angular sometimes ribbed, 1.0–1.5 mm long, 1.0–1.7 mm wide; lobes triangular, 1.0–1.5 mm long, glabrous, scabridulous on margin. Corolla white or occasionally pale blue; tube short, 0.5–0.8 mm long, not exceeding calyx lobes, glabrous; lobes linear, 2–3 mm long, geniculate at c. 1/3 of their length from tube, with a transverse line of hairs on lobes at knee. Filaments 0.2–0.5 mm long; anthers globose, 0.4–0.6 mm long. Ovules numerous in each locule. Style 0.5 mm long, glabrous; stigma simple, filiform to narrowly conical, c. 0.8 mm long. Stamens and style exserted from corolla tube but enclosed by

lobes, overtopped by ring of hairs on lobes. Capsule turbinate-obovoid, 2.5–4.5 mm long 3.0–3.5 mm wide, laterally compressed, glabrous, sometimes 4-ribbed; calyx lobes erect; beak, c. 0.5 mm long, truncate, not exceeding calyx lobes. Seeds 3 or 4 per capsule, transversely ellipsoidal, c. 0.5 mm wide; surface brown, scrobiculate. **Figs 1G & 3C, D & E.**

Selected specimens: Queensland. COOK DISTRICT: Dauan Island, Murray Group, 9°25'S, 142°32'E, Jul 1974, *Heatwole & Cameron* 800 (BRI); Murrays Island [Murray Islands], undated, *Chalmers* [MEL 115168] (MEL); Arthur Creek on the track from Batavia Downs to Meluna, c. 21 km SSW of Batavia Downs, 12°50'S, 142°36'E, Jul 1985, *Clarkson* 6089 (BRI); Endeavour River, 1770, *Banks & Solander* (BRI); New Holland [Endeavour River], 1770, *Banks & Solander* [MEL 115113] (MEL); Endeavour River, 1882, *Persietz* 287 (MEL). NORTH KENNEDY DISTRICT: Cleveland Bay, 1882, *Berthand* [MEL 115162] (MEL). SOUTH KENNEDY DISTRICT: Turtle Bay, Carlisle Island, 35 km N of Mackay, 20°47'S, 149°17'E, Sep 1986, *Sharpe & Batianoff* 4418 (BRI); Port Mackay, undated, *Dietrich* 478 (MEL). PORT CURTIS DISTRICT: Fitzroy River, undated, *Bowman* s.n. [MEL 115111] (MEL); Rockhampton, undated, *Thozet* 574 (MEL).

Distribution and habitat: *O. biflora* occurs from India through New Guinea to Samoa and north to the Marshall Islands. In Australia it is found along the eastern coast of Queensland from Cape York to Rockhampton and on offshore islands (**Map 1**). It grows in woodlands and forests which fringe streams or intertidal areas on moist or swampy soils.

Conservation status: This species is not considered rare or threatened at present.

2. *Oldenlandia corymbosa* L., Sp. pl. 1: 119 (1753); *Hedyotis corymbosa* (L.) Lam., Encycl. 1: 272 (1791). **Type:** Drawing in Plumier, Nov. Pl. Gen. t. 36. (1703), lecto *vide* Verdcourt, Fl. Trop. E. Africa, Rubiaceae 309 (1976).

Decumbent or prostrate annual herbs, divaricately branched; branchlets terete or ribbed, glabrous, smooth or scabridulous on ribs. Leaves subsessile or shortly petiolate, linear to narrowly elliptic, 10–30 mm long, 1.0–5.5 mm wide, discolorous, glabrous or sparsely covered with minute scabrous hairs above and on margin, glabrous below, attenuate at base, acute at apex. Stipule-sheath 1–2 mm long, glabrous or rarely with a few scattered minute scabrous hairs, truncate or produced into triangular lobe; margin with 2 or 3 laciniae up to 2 mm long. Inflorescences 2–7-flowered umbel-like corymbs or flowers solitary in leaf axils, both kinds present on one plant; peduncle 3–17 mm long; pedicels 1–7 mm long, both glabrous or with a few scattered minute scabrous hairs; bracts minute. Calyx-tube subglobose, c. 1 mm diameter, glabrous; lobes triangular, 1.0–1.5 mm long, keeled, scabridulous on margin and keel. Corolla white, glabrous outside; tube cylindrical, 0.5–1.0 mm long; lobes ovate, 0.5–1.5 mm long, with a line of hairs at base of lobes. Stamens included; filaments c. 0.2 mm long; anthers shortly oblong, c. 0.4 mm long. Ovules 35–40 per locule. Style 0.2–0.5 mm long, glabrous or hirtellous; stigma bifid; lobes subulate, c. 0.2 mm long, erect, spreading at apex, clavate hairs on inner surface of lobes. Capsule depressed ovoid or broadly ovoid, 1.5–2.5 mm long, 2–2.5 mm wide, slightly furrowed along dissepiment, glabrous; calyx lobes erect, slightly recurved at apex; beak scarcely raised, truncate, not exceeding calyx lobes. Seeds numerous, obconic to depressed obconic, laterally compressed, c. 0.3 mm long; surface light brown, reticulate-areolate.

O. corymbosa has a pantropical distribution but probably is only native to Africa and India. Australian distributional data is presented under varieties.

There are a number of varieties described but only two are recognizable in Australia.

1. Capsule depressed ovoid; flowers solitary or in 2–7-flowered umbel-like corymbs; style glabrous var. *corymbosa*
 Capsule broadly ovoid to subglobose; flowers solitary or in 2-flowered cymes at the nodes, never in groups of 3–7 flowers; style hirtellous var. *caespitosa*

2a. *Oldenlandia corymbosa* var. *corymbosa*

Distinguishing characters are as set out in the above key. **Fig. 2A–C.**

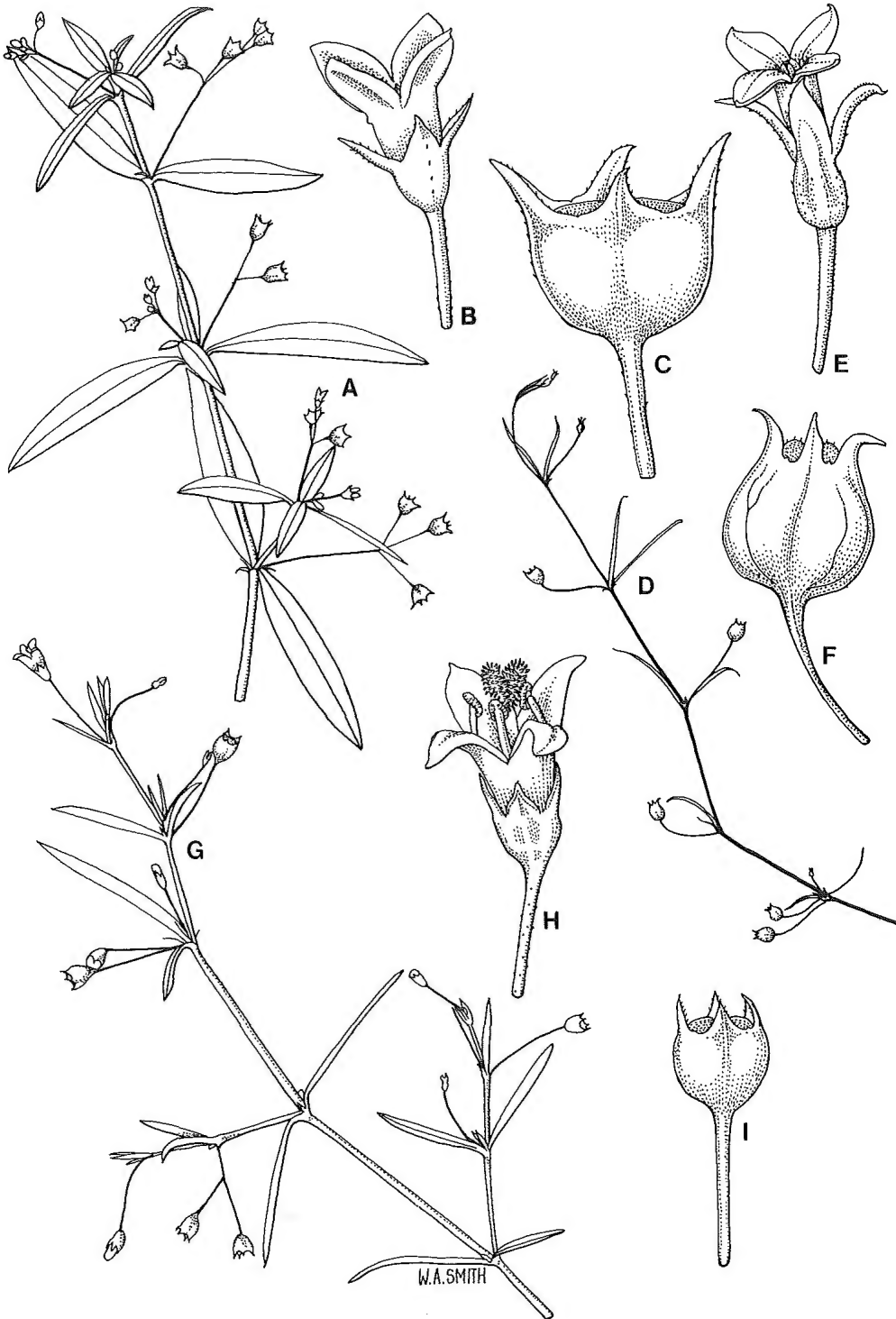


Fig. 2. *Oldenlandia corymbosa* var. *corymbosa*: A. branchlet with inflorescences $\times 1$. B. flower $\times 8$. C. side view of fruit $\times 8$. *Oldenlandia galioides*: D. branchlet with flowers and fruit $\times 1$. E. flower $\times 8$. F. side view of fruit $\times 8$. *Oldenlandia subulata*: G. branchlet with flowers and fruit $\times 1$. H. flower $\times 4$. I. side view of fruit $\times 4$. A–C, Halford Q850; D–F, Halford H66; G–I, Halford Q851.

Selected specimens: Western Australia. GARDNER DISTRICT: Amax base camp, Mitchell Plateau, 14°49'S, 125°51'E, Jun 1976, *Hnatiuk* MP82 (PERTH). DAMPIER DISTRICT: One Arm Point, M. Dampierland, 16°26'S, 123°05'E, Nov 1987, *Carter* 145 (PERTH); Broome, 17°58'S, 122°14'E, May 1986, *Kenneally* 9740 (PERTH). Northern Territory. DARWIN AND GULF REGION: Point Stuart, 12°21'S, 131°49'E, Jan 1958, *Tulloch* s.n. (DNA); A.I.B., Mitchell Street, Darwin, 12°24'S, 130°50'E, Jun 1964, *Nelson* 1010 (BRI,DNA); Magela Creek, Mudginberri Station, 12°27'S, 132°53'E, May 1983, *Dunlop & Taylor* 6164 (BRI,NSW); Oenpelli, 12°18'S, 133°04'E, Sep 1948, *Specht* 1084 (AD,BRI,CANB,MEL,NSW); Katherine, Boab Caravan Park, 14°28'S, 132°16'E, Apr 1989, *Halford* H10 (BRI). Queensland. COOK DISTRICT: Badu Island, Torres Strait, Jan 1980, *Garnett* 367 (BRI); Thursday Island, Douglas Street in main shopping centre, 10°35'S, 142°13'E, Apr 1986, *Clarkson* 6466 (BRI); Weipa camping grounds, 12°41'S, 141°53'E, Aug 1987, *Halford* 1112 (BRI,MEL,NSW); Lizard Island, near airport, 14°40'S, 145°28'E, Oct 1988, *Batianoff* 10350 (BRI); Cooktown, cricketfield, 15°28'S, 145°15'E, May 1989, *Halford* H127 (BRI,K); Abbott Street, Cairns, Jun 1941, *Barnard* 20 (BRI,CANB); Georgetown, C.E. Green Park, 18°17'S, 143°33'E, May 1990, *Halford* Q265 (BRI,MEL). NORTH KENNEDY DISTRICT: Townsville – West end at base of Castle Hill, Feb 1980, *Stanley* 8041 (BRI). SOUTH KENNEDY DISTRICT: Collinsville area, May 1985, *McIvor* s.n. (BRI); Finch Hatton, 21°02'S, 148°38'E, May 1975, *Andrews & Simon* S4 (BRI). LEICHHARDT DISTRICT: Mount Coolon, 21°23'S, 147°20'E, May 1990, *Halford* Q195 (AD,BRI); Emerald, 6 Opal Street, 23°31'S, 148°10'E, May 1989, *Halford* H145 (BRI,MEL).

Distribution and habitat: The first record of *O. corymbosa* var. *corymbosa* in Australia was in 1933 as a weed in the streets of Cairns, Queensland. It is now widespread across northern Australia from Broome to Kununurra in Western Australia, Darwin to Katherine in the Northern Territory and along the east coast from Cape York to near Mackay in Queensland (Map 2). It grows in lawns, garden beds and other disturbed areas.

2b. *Oldenlandia corymbosa* var. *caespitosa* (Benth.) Verdc., Kew Bull. 30: 298 (1975); *Oldenlandia herbacea* (L.) Roxb. var. *caespitosa* Benth., in Hook., Niger Fl. 403 (1849); *Oldenlandia caespitosa* (Benth.) Hiern, Fl. Trop. Afr. 3: 61 (1877). **Type:** [Africa.] Liberia, Cape Palmas, *Vogel* 51 (holo: K, photo BRI).

Distinguishing characters set out in the above key.

Specimens examined: Queensland. PORT CURTIS DISTRICT: North Rockhampton, Feb 1980, *Stanley* 479 (BRI); Rockhampton, Riverside Municipal Caravan Park, 23°22'S, 150°32'E, May 1990, *Halford* Q154 (BRI); 11 km SE of Miriam Vale on road to Agnes Water, 24°22'S, 151°40'E, May 1990, *Halford* Q151 (BRI); Rosedale, N.C. line, Nov 1932, *Dovey* 168 (BRI). BURNETT DISTRICT: Monto Golf Club, Mar 1976, *Romano* [AQ117759] (BRI). WIDE BAY DISTRICT: Buss Park, next to Council Chambers, 24°52'S, 152°21'E, Mar 1990, *Halford* Z152 (BRI,K); 23 km SW of Bauple, Glen Echo Road crossing, Munna Creek, *Halford* Q297 (BRI,DNA).

Distribution and habitat: *O. corymbosa* var. *caespitosa* is native of Africa and India. In Australia it grows in coastal districts from Rockhampton to just south of Maryborough (Map 2); usually in lawns, on roadsides and other disturbed areas. It was first collected in Australia at Rosedale near Bundaberg in 1932.

Notes: Bremekamp (1952) kept this as a distinct species however Verdcourt (1975) disagreed with this treatment arguing that although the extremes of *O. corymbosa* and *O. caespitosa* are very different there are many specimens difficult to place and he sunk *O. caespitosa* as a variety of *O. corymbosa*. B. Verdcourt (comm. via ABLO (T. Macfarlane)) commented that the Australian material that I had sent to Kew for verification of identification was in fact intermediate between the usual African form of *O. corymbosa* var. *corymbosa* and *O. corymbosa* var. *caespitosa*. There is some debate as to whether there are distinct varieties in this plexus or not. Sivarajan and Biju (1990) considered *O. corymbosa* var. *caespitosa* unworthy of varietal distinction after studying Indian material and material under cultivation. As the Australian material is quite distinct and easily separable from Australian *O. corymbosa* var. *corymbosa* I have retained it under the name *O. corymbosa* var. *caespitosa*.

3. *Oldenlandia galioides* (F. Muell.) F. Muell., Syst. cens. Austral. pl. 74 (1882); *Hedyotis galioides* F. Muell., Fragm. 4: 38 (1863). **Type:** [Northern Territory. DARWIN AND GULF REGION:] near Adam [MacAdam] Range along the rivulets, October 1855, *Mueller* (lecto (here designated): K(top right hand element)).

Sprawling, procumbent to ascending, diffuse, annual herbs; branchlets slender, terete or weakly ribbed, glabrous, smooth or minutely tuberculate, often rooting at nodes. Leaves linear to narrow elliptic, (5–)10–30 mm long, (0.2–)0.5–3.0 mm wide, lamina flat or slightly recurved or revolute at least in dry state, glabrous or sparsely covered with minute scabrous hairs, attenuate at base, acute at apex. Stipule-sheath 0.5–1.0 mm long, glabrous, smooth or minutely tuberculate, occasionally produced into triangular lobe, 1.0–1.5 mm long, sometimes bifid; margin entire or fimbriate. Flowers solitary in leaf



Fig. 3. *Oldenlandia spermacocoides*: A. branchlet with inflorescences $\times 1$. B. side view of capsule $\times 6$. *Oldenlandia biflora*: C. branchlet with inflorescences $\times 0.75$. D. side view of capsule $\times 6$. E. flower $\times 6$. A,B, Halford H56; C, Sharpe *et al.* 4475; D,E, Clarkson 6089.

axil or if more than one, with rudiments of branchlet between them; pedicels capillary, 3–17 mm long, not as long as leaves, minutely tuberculate. Calyx-tube subglobose, 0.7–0.9 mm diameter, scabridulous; lobes triangular, 0.8–1.5 mm long, keeled, scabridulous on margin. Corolla white, tubular to narrowly infundibular, glabrous outside; tube 0.7–1.5 mm long, glabrous inside and at throat; lobes linear, 0.5–1.0 mm long. Stamens subsessile; anthers linear, 0.3–0.7 mm long. Ovules 45–60 per locule. Style 0.8–1.5 mm long, glabrous; stigma bifid; lobes subulate, c. 0.5 mm long. Capsule ovoid or ovoid-globose, 1.5–3.0 mm long, 1.0–3.0 mm wide, glabrous or with minute scabrous hairs, laterally compressed; calyx lobes erect; beak 0.5–0.7 mm long, not protruding above calyx lobes, splitting loculicidally, occasionally secondarily splitting septicidally but only above calyx lobes. Seeds numerous, obconic, laterally compressed, c. 0.3 mm long; surface pale brown, reticulate-areolate. **Figs 1A & 2D–F.**

Selected specimens: Papua New Guinea. WESTERN PROVINCE: Lake Daviumbu, Middle Fly River, Aug 1936, *Brass* 7533 (BRI). Western Australia. GARDNER DISTRICT: Near Camp Creek, Mitchell Plateau, 14°52'S, 125°46'E, May 1978, *Kenneally* 6641 (PERTH). FITZGERALD DISTRICT: 'Pentecost Downs', Royston Creek, 16°05'S, 127°20'E, Jun 1982, *Jacobs* 4427 (NSW). CANNING DISTRICT: Gookeys Tank, South Esk Tablelands, 20°15'S, 126°34'E, Apr 1979, *George* 15438 (DNA, PERTH). FORTESCUE DISTRICT: Yule River, Woodstock Station, Apr 1958, *Burbridge* 5955 (AD, CANB, PERTH). Northern Territory. DARWIN AND GULF REGION: Ritjirirur Swamp, Elcho Island, 11°58'S, 135°37'E, Jul 1975, *Latz* 6123 (DNA); Hemple Bay, Groote Eylandt, 13°44'S, 136°42'E, May 1948, *Specht* 362 (AD, BRI, CANB, MEL); South Bay, Bickerton Island, 13°45'S, 136°06'E, Jun 1948, *Specht* 474 (AD, BRI, CANB, MEL, NSW, PERTH); Gulf of Carpentaria, Maria Island, 14°52'S, 135°44'E, Jul 1974, *Dunlop* 2814 (DNA, NSW); 29 miles [46.7 km] W of Tamubirni [Tanumbirini] Homestead, 16°22'S, 134°56'E, Jun 1971, *Henry* 10 (DNA). CENTRAL NORTHERN REGION: Wartupyny Rockhole, 22°48'S, 131°33'E, Jan 1972, *Latz* 2132 (AD, CANB, DNA, NSW, PERTH). Queensland. COOK DISTRICT: Sabai, Torres Strait, 9°23'S, 142°35'E, May 1971, *Lawrie* 8 (BRI); Archer River, Wenlock-Coen Road, 13°27'S, 142°56'E, Jul 1948, *Brass* 19735 (CANB); 90 miles [144.8 km] W of Musgrave Telegraph Office, Jun 1968, *Pedley* 2680 (BRI, MEL). BURKE DISTRICT: Mornington Island, 16°29'S, 139°34'E, Jun 1963, *Tindale & Aitken* s.n. (AD); Sybella Creek, 17 km S of Mt Isa, 20°53'S, 139°27'E, May 1987, *Harris* 174 (BRI). NORTH KENNEDY DISTRICT: Murray Falls, 18°09'S, 145°49'E, Aug 1987, *Halford* 1127 (BRI). PORT CURTIS DISTRICT: N of S end of Curtis Island, towards Connor Bluff, Mar 1966, *Blake* 22571 (BRI). MORETON DISTRICT: Park Ridge, 15 miles [24 km] S of Brisbane, 27°43'S, 153°02'E, Feb 1978, *Sharpe & Elsol* 216 (BRI).

Distribution and habitat: *O. galioides* is widespread across northern Australia from Chester Range, Western Australia to the east coast of Queensland and south to Brisbane (Map 3). It also extends into the Western Province of Papua New Guinea. It grows usually in moist soils, in swamps, along creek banks and beds, and on the edge of ephemeral and permanent waterbodies in woodlands, forests and grasslands.

Conservation status: This species is not considered to be rare or threatened at present.

Typification: Mueller in his protologue refers to material he collected around Victoria River during the Gregory Expedition of Northern Australia and a Bowman specimen from the vicinity of Broad Sound. In the MEL herbarium there is 1) a Mueller specimen [MEL 61483] from the 'Lower Victoria River, May 1856' which consist of four fruiting fragments and two flowering fragments; 2) a specimen [MEL 61482] with a slip of paper label '117 Broadsound' believed to be in Bowman's hand. At Kew there is a Mueller specimen 'Near Adam [MacAdam] range along riverlets, Oct 1855, *F. Mueller*.' The Kew sheet is chosen as lectotype because it is part of the original material and is a better specimen than the ones at MEL. The element in the top right is selected as lectotype because it matches the protologue and has flowers, fruit and leaves all on the one element.

Notes: *O. galioides* has affinities with *O. herbacea* from India and Africa. *O. galioides* is distinguishable by its sprawling, procumbent to ascending habit, and its ovoid or ovoid-globose capsules with a narrow beak that does not extend beyond the persistent calyx lobes. Smith and Darwin (1988) commented that *O. galioides* may not be distinct from *O. tenuifolia*. *O. galioides* is easily distinguished by its tubular or narrowly infundibular corolla tube and its ovoid or ovoid-globose capsules.

4. *Oldenlandia tenuifolia* N. Burman, Fl. Ind. 37 t. 14 f. 1 (1768). **Type:** Java, *D. Pryon* (holo: G).

Oldenlandia tenuifolia J.R. & G. Forster, Fl. Ins. Austr. Prodr. 11 (1786), nom illeg. **Type:** [Vanuatu.] Tanna, *J.R. & G. Forster* (holo: BM n.v.).

Hedyotis tenuifolia Smith, in Rees, Cycl. 17 (1811). **Type:** [Vanuatu.] Tanna, *J.R. & G. Forster* (holo: LINN, microfiche BRI).

Oldenlandia aparine S. Moore, J. Bot. 65: 243 (1927). **synon. nov.** **Type:** Papua New Guinea. [GULF PROVINCE:] Ihu, Vailala River, 20 February 1926, *L.J. Brass* 1017 (iso: BRI).

Decumbent annual herbs, sparingly branched; branchlets glabrous, rarely papillose at base, often rooting at nodes. Leaves sessile, linear rarely narrowly elliptic to narrowly obovate, 20–50 mm long, 1–5 mm wide, glabrous or sparsely covered with minute scabrous hairs along margins and on lamina near apex, attenuate at apex and base. Stipule-sheath c. 1 mm long, truncate or produced into triangular lobe with usually 2 or 3 laciniae near apex. Flowers axillary, solitary; pedicels usually stout, somewhat reflexed in mature fruit, 2–10 mm long, glabrous. Calyx-tube globose, 1.5 mm diameter, glabrous; lobes triangular, 1.0–1.5 mm long, glabrous, scabridulous on margin, collectors sometimes present between lobes. Corolla infundibular to broadly tubular, glabrous outside; tube 2.3–2.5 mm long, glabrous at throat; lobes ovate, 1.5–2.5 mm long. Stamens exserted; filaments 0.3–1.0 mm long; anthers linear, c. 0.7 mm long. Ovules numerous in each locule. Style exserted, 2–3 mm long, glabrous; stigma bifid; lobes clavate, 0.5–1.3 mm long. Capsule subglobose, 2.5–3.5 mm diameter, glabrous, not markedly furrowed along dissepiment; calyx lobes erect; beak 0.4–0.8 mm long, rounded, not protruding above calyx lobes. Seeds numerous, depressed obconic; surface brown, reticulate.

Selected specimens: Northern Territory. DARWIN AND GULF REGION: Girraween Lagoon, 4 km E of Stuart Highway along Girraween road, 12°31'S, 131°05'E, Apr 1983, *Briggs* 779 (BRI); Jabiru, Retention Dam 1, 12°40'S, 132°54'E, Apr 1983, *Henshall* 4009 (DNA, MEL); Channel Point, 13°08'S, 130°15'E, Oct 1986, *Clark & Wightman* 12 (DNA). Queensland. COOK DISTRICT: near Cooktown, May 1970, *Blake* 23287 (BRI, MEL, NSW). NORTH KENNEDY DISTRICT: Braemeadows, Ingham, Feb 1962, *Webb & Tracey* 5865 (BRI).

Distribution and habitat: *O. tenuifolia* occurs from Channel Point to Jabiru, Northern Territory and near Cooktown and Ingham, Queensland (**Map 4**), and eastern Malesia. It grows on damp soils in *Melaleuca* swamps, tropical wet grasslands, or monsoon forests.

Notes: Burman (1768) described *O. tenuifolia* based on a specimen collected by Pryon from Java. Forster (1786) further interpreted *O. tenuifolia* based on material he and his father collected on Tanna, Vanuatu (New Hebrides). Smith (1811) considered the Pryon specimen to belong to the Linnaean *H. herbacea* (*O. herbacea*) while he used the Forster specimen for a new species *H. tenuifolia*. The Pryon specimen is only a small fragment but has a well preserved flower which shows a broad tubular corolla and a rather stout glabrous pedicel. In contrast *O. herbacea* (*H. herbacea*) has a narrow cylindrical corolla and slender pedicels. I disagree with Smith's statement that Burman's species belongs to *H. herbacea* and I consider the Pryon and Forster specimens to belong to the same taxon which is distinct from the Linnean species *O. herbacea* (*H. herbacea*). The correct name for this taxon is *Oldenlandia tenuifolia* N. Burman. In flower and seed morphology *O. tenuifolia* N. Burman closely resembles *O. subulata* Korth. However, *O. tenuifolia* is distinguishable by its stout, glabrous pedicels which are mostly reflexed when with fruit, its axillary, solitary flowers and its sparsely branched stems.

It is somewhat variable in pedicel length and appears to intergrade with *O. brachypoda* DC. which occurs in India and Malesia. Investigations into this species complex may reveal that these taxa would probably best be considered at subspecific rank.

5. *Oldenlandia subulata* Korth., Ned. Kruidk. Arch. 2: 153 (1851). **Type:** Borneo, Poeloe-Lampe, *Korthals* (holo: PR(PR908219-458)).

Sprawling or ascending annual herbs, sparingly branched; branchlets terete or slightly ribbed, glabrous, smooth or sparsely to moderately papillose, often rooting at nodes. Leaves sessile, linear, 2.0–5.5 mm long, 1–3 mm wide, glabrous or sparsely to moderately covered with scabrous hairs above, glabrous below, attenuate at base and apex. Stipule-sheath 0.5–1.5 mm long, glabrous or nearly so, produced into triangular lobe, 1.0–1.5 mm long, with usually 1–3 laciniae near apex. Flowers axillary, solitary, very rarely paired on peduncles or in lax terminal monochasial cymes; pedicels slender, 6–25 mm long, papillose. Calyx-tube globose, 1–2 mm diameter, glabrous; lobes triangular to narrowly ovate, 1.0–2.5 mm long, keeled, scabridulous on margin. Corolla white rarely blue, infundibular to broadly tubular, glabrous outside; tube 1.5–3.5 mm long, glabrous

at throat; lobes oblong, 1.5–3.5 mm long. Stamens exerted from tube; filaments 1.0–1.5 mm long; anthers linear, 0.6–1.0 mm long. Ovules 70–100 per locule. Style exerted from tube, 2.5–4.0 mm long, glabrous; stigma bifid; lobes clavate, 1.0–1.7 mm long. Capsule subglobose, 2.5–3.5 mm diameter, glabrous, not markedly furrowed at dissepiment; calyx lobes erect; beak 1–2 mm long, rounded, not protruding above calyx lobes. Seeds numerous, depressed obconic, laterally compressed, c. 0.3 mm long; surface pale brown, reticulate-areolate. **Fig. 2G–I.**

Selected specimens: Queensland. COOK DISTRICT: Unigan Nature Reserve, Weipa, Mar 1990, *Forster* PIF6500 & *O'Reilly* (BRI,DNA,MEL,K,L,PERTH,QRS); Claudie scrub, 12°45'S, 143°16'E, Apr 1988, *Forster* PIF4201 & *Liddle* (A,BISH,BRI,DNA,LAE,MO); Leo Creek, upstream from falls, on eastern fall of McIlwraith Range, 13°40'S, 143°23'E, Jul 1978, *Clarkson* 2384A (BRI); Lizard Island, 14°40'S, 145°27'E, May 1975, *Brynes* 3116 (BRI). NORTH KENNEDY DISTRICT: Hinchinbrook Island, little Ramsay Bay, on eastern side of island, Aug 1975, *Sharpe* 1597 (BRI). PORT CURTIS DISTRICT: Northumberland Islands, Sep 1802, *Brown* s.n. (CANB); 'Raspberry Vale' 1 mile [1.6 km] from homestead, 22°34'S, 150°23'E, Apr 1945, *Blake & Webb* 15560 (BRI); S.F. 365, Mount Stowe, 6.5 km SE of Yarwun, 23°54'S, 151°09'E, Jun 1988, *Gibson* TO1360 (BRI). MORETON DISTRICT: On David Low Highway, Marcoola, c. 5 km S of Coolumb Beach, 26°34'S, 153°05'E, May 1988, *Sharpe* 4801 (BRI); Near Banyo, May 1932, *Blake* s.n. (BRI).

Distribution and habitat: In Australia *O. subulata* is chiefly coastal from Cape York Peninsula to South East Queensland, also on offshore islands (**Map 5**). It occurs on moist soils in swamps, on lagoon margins and along creek banks mostly in *Melaleuca* forests or woodlands, or heathlands. It has been occasionally recorded growing with *O. galioides*.

Conservation status: This species is not considered to be rare or threatened.

Notes: The collections included by me in *Oldenlandia subulata* had been determined previously as *O. herbacea* (*H. herbacea*) in Australia and New Guinea. I have examined collections of *O. herbacea* from India and Africa including the type and have found them to be quite distinct from the species considered here. In *O. subulata* the corolla is broadly tubular to campanulate, with the corolla tube scarcely longer than the erect lobes of the calyx, and the rounded apex of the subglobose-ovoid capsule shorter than the erect calyx lobes. In contrast *O. herbacea* the corolla is narrowly cylindrical, with the tube usually exceeding the calyx lobes by 1.5 times, and the drawn out apex of the subglobose capsule extended above the small adpressed calyx lobes.

6. *Oldenlandia polyclada* (F. Muell.) F. Muell., Syst. cens. Austral. pl. 74 (1882); *Hedyotis polyclada* F. Muell., Fragm. 8: 146 (1874). **Type: [Queensland. NORTH KENNEDY DISTRICT:] Rockingham Bay, undated, *Dallachy* (lecto (here designated); MEL(MEL 61484)).**

Low spreading herbaceous perennial, densely branched; branchlets quadrangular and hispidulous when young becoming rounded and glabrous with age. Leaves sessile, linear to narrowly elliptic or narrowly obovate, 7–40 mm long, 2–6 mm wide, discolorous, glabrous or with minute scabrous hairs above, glabrous below, attenuate at base, acute at apex with mucronate, midrib prominent below. Stipule-sheath c. 1 mm long, hispidulous, produced into triangular lobe, 1.0–1.5 mm long; margin fimbriate. Inflorescences terminal 2–8-flowered fascicles, rarely flowers solitary; pedicels slender, 3–6 mm long, glabrous or hispidulous. Calyx-tube subglobose, c. 1.5 mm diameter, glabrous; lobes ovate-triangular or linear-lanceolate, 2–8 mm long, joined at base into free tube, entire or serrulate on margin, mucronate at apex. Corolla pale rose, infundibular to broadly tubular, sparsely pubescent outside; tube 2.5–4.0 mm long, sparsely pubescent inside; lobes linear to semi-lanceolate, 2.5–3.5 mm long, sparsely pubescent inside. Stamens exerted; filaments, 1.5–2.0 mm long; anthers linear-oblong 1.5–2.0 mm long. Ovules c. 30–40 per locule. Style exerted, 6–7 mm long; stigma simple or bifid; lobes linear, c. 1 mm long. Capsule subglobose, 2.0–2.5 mm diameter, glabrous or nearly so, not markedly furrowed along dissepiment; calyx lobes spreading; beak c. 1 mm long, rounded, not protruding above calyx lobes. Seeds numerous, depressed obconic, obtriangular in outline, laterally compressed, c. 0.5 mm wide; testa brown, reticulate-areolate. **Fig. 4.**

Specimens examined: Queensland. COOK DISTRICT: Barrons Range, 'Kings Plains', SW of Cooktown, 15°37'S, 145°05'E, Jun 1983, *Godwin* C2420 (BRI); ditto, *Godwin* C2423 (BRI). NORTH KENNEDY DISTRICT: cultivated from cuttings collected from top of Tully Falls, 17°47'S, 145°34'E, undated, *Hockings* [AQ339001] (BRI).

Distribution and habitat: *O. polyclada* is known only from the Barron Range, south west of Cooktown and in the Cardwell Range west and south west of Tully in Queensland

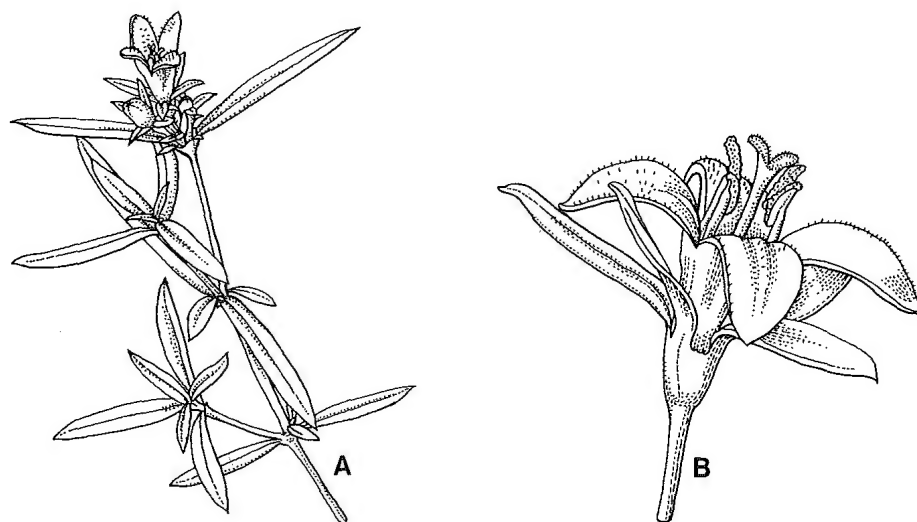


Fig. 4. *Oldenlandia polyclada*: A. branchlet with inflorescence $\times 1$. B. flower $\times 4$. A, B, Halford Q852.

(Map 6). The only habitat information for this species is from the Barron Range specimen 'semi-evergreen, mixed vine thicket on limestone and sandstone, sandy loamy soils'.

Conservation status: The species has a range of 340 km but has only been collected twice since the original collections were made by Dallachy last century. The species has been collected in the Tully Falls National Park. A conservation coding of 3RC is appropriate.

Typification: In his protologue Mueller refers to a Dallachy specimen collected at Rockingham Bay. On examination of material from K and MEL there are four specimens collected by Dallachy that could be part of the material Mueller base this taxon on. One specimen MEL 115103 has the following notes recorded on it in Dallachy's handwriting: 'Friday 10 September 1869 Mount Graham Peak growing in the [illegible word] of the peak foliage a lime dark green flowers very pale pink [illegible word]'. This specimen is dated before the publication of the name; however the leaf length of most of the elements on the sheet does not match the dimensions given in the protologue (they are 4–20 mm long (mostly shorter than 8 mm long) compared to 8.5–17.0 mm long in the protologue). The other three specimens are undated with label information in Mueller's hand 'Rockingham Bay Dallachy'. The specimen MEL 61484 is select as lectotype because it fits Mueller's description and has flowers and capsules present.

7. *Oldenlandia tenelliflora* (Blume) Elmer var. *papuana* Valeton, Nova Guinea 14: 243, pl 22, fig. A, 1–5 (1925); *Hedyotis tenelliflora* Blume var. *papuana* (Valeton) Merr. & Perry, J. Arnold Arbor. 26(1): 3 (1945). **Syntypes:** [Indonesia. Irian Jaya:] Sudabh. Swart-Fluss 1250 m in einem Acker der Papoeas, 24 Nov 1920, *Lam* n.2965, *n.v.*; Westabhang Swart-Tal 1400 m, offene Grasflache, 24 Nov 1920, *Lam* n. 2085. *n.v.*

Procumbent herbs; branchlets tetragonous, glabrous, smooth or sometimes tuberculate on ribs. Leaves linear, 15–40 mm long, 1–2 mm wide, glabrous or with scabrous hairs along margin and on lamina near apex, rounded or truncate at base, acute at apex with mucro; sessile or shortly petiolate, petiole 0.5 mm long. Stipule-sheath 1.0–1.5 mm long, glabrous or pubescent, truncate or rounded with 2–5 setae, 2–3 mm long. Inflorescences axillary, 2–4-flowered subsessile cymes; pedicels c. 1 mm long. Calyx-tube subglobose, c. 1 mm diameter, glabrous; lobes narrowly triangular, 1.5–2.0 mm long, joined at base into free tube, scabridulous on margin. Corolla white, infundibular, glabrous outside;

tube 1.5–2.0 mm long, glabrous at throat; lobes linear-oblong, 1.5–2.0 mm long, acute at apex. Stamens exserted; filaments filiform, 1.0–1.5 mm long; anthers linear, 0.8–0.9 mm long. Ovules numerous in each locule. Style terete, 3.0–3.5 mm long, glabrous; stigma bifid; lobes linear, 0.3–0.6 mm long. Capsule ovoid to subglobose, 2.0–2.5 mm diameter, glabrous; calyx lobes erect; beak narrow, c. 0.8 mm long, not protruding above calyx lobes. Seeds depressed obconic, laterally compressed, c. 0.5 mm wide; surface brown, reticulate-areolate.

Specimens examined: Indonesia. Irian Jaya: Balim River, Dec 1938, *Brass* 11628 (BRI). Papua New Guinea. CENTRAL PROVINCE: Mafulu, Sep–Nov 1933, *Brass* 5152 (BRI). PROVINCE UNKNOWN: Hayfield, Kungingini Road, Dec 1954, *Womersley & Simmonds* 6875 (BRI); Australia. Queensland. COOK DISTRICT: Daintree River, 1890, *Pentzke* [MEL 115134] (MEL).

Distribution and habitat: *O. tenelliflora* var. *papuana* is recorded from New Guinea; within Australia it is known only from the Daintree River area, north of Mossman, Queensland (Map 6). No ecological information is available.

Conservation status: In Australia this variety is known from one collection made 100 years ago. A preliminary search of likely localities in the Daintree River area was undertaken in September 1990 but no new collections were made. More field investigations are required before considering the species as extinct in Australia. A conservation coding of 2K is appropriate.

8. *Oldenlandia argillacea* (Halford) Halford, **comb nov.**

Hedyotis argillacea Halford, *Austrobaileya* 3: 203 (1990) **Type:** Northern Territory. DARWIN AND GULF DISTRICT: 6 km NE of Cape Crawford Roadhouse towards Borroloola, 30 April 1989, *D. Halford* H93 (holo: BRI; iso DNA, K, PERTH).

See Halford (1990) for a description, illustration and notes on distribution.

9. *Oldenlandia coerulescens* (F. Muell.) F. Muell., *Syst. cens. Austral. pl.* 74 (1882); *Hedyotis coerulescens* F. Muell., *Fragm.* 4: 38 (1863). **Type:** [Queensland. LEICHHARDT DISTRICT:] Peak Downs, undated, *Mueller* (lecto: (here designated): MEL (MEL 61480); isolecto: K).

Erect annual herbs to 30 cm high, usually much branched from near the base; branchlets tetragonous becoming terete, sometimes with minute scabrous hairs on ribs otherwise glabrous. Leaves sessile, linear to lanceolate, 15–25 mm long, 1.0–2.5 mm wide, glabrous or with minute scabrous hairs above, attenuate at base, acute at apex. Stipule-sheath 1–1.5 mm long, truncate or produced into triangular lobe; margin entire or with 1–3 fimbriae. Inflorescences lax, terminal dichasial cymes with leaf-like bracts decreasing in size towards apex. Flowers solitary or paired at nodes; pedicels 2–10 mm long. Calyx-tube obloid-ellipsoid, 1.0–3.0 mm long, 0.5–1.5 mm wide, with minute scabrous hairs; lobes ovate, 0.7–1.3 mm long, slightly keeled, glabrous, scabridulous on margin. Corolla white, pale pink or mauve, glabrous outside; tube short 0.5–1.0 mm long, glabrous at throat; lobes linear-oblong, 2.0–4.5 mm long, geniculate at c. 1/3 to 1/4 of their length from tube, with a line of hairs on lobes at knee. Filaments 0.3–0.5 mm long; anthers linear-oblong, 0.5–0.8 mm long. Ovules 20–50 per locule. Style terete, 0.3–1.0 mm long; stigma bifid; lobes filiform, c. 0.5 mm long, erect. Stamens and style exserted from corolla tube but enclosed by lobes, overtopped by ring of hairs. Capsule obloid-ellipsoid, 4–5 mm long, 2.5–3 mm wide, glabrous, furrowed along dissepiment; calyx lobes erect slightly recurved at apex; beak 0.5 mm long, retuse-truncate, not protruding above calyx lobes. Seeds numerous somewhat scutelliform, broadly elliptic in outline, 0.5–0.7 mm wide; surface dark brown, reticulate-foveate.

Selected specimens: Queensland. BURKE DISTRICT: 54 km NNW of Hughenden, c. 1 km N of Lookout at Porcupine Gorge, 20°24'S, 144°28'E, May 1990, *Halford* Q211 (AD, BRI, DNA, MEL, PERTH). GREGORY NORTH DISTRICT: 6 km N of Coolibah Bore, Headingley Station, 21°08'S, 138°24'E, May 1985, *Neldner & Stanley* 1803 (BRI); 15 km of Winton along road to Boulia, 22°21'S, 142°53'E, May 1990, *Halford* Q278 (BRI, K). MITCHELL DISTRICT: 34 miles [54.7 km] NW of Longreach, 22°55'S, 143°05'E, Feb 1953, *Davidson* 326 (BRI); 46 km E of Longreach along road to Barcaldine, 23°31'S, 144°39'E, May 1990, *Halford* Q285 (BRI); c. 7 km N of Jundah, 24°48'S, 143°07'E, May 1988, *Nicolson & Novelty* 73 (BRI); Malvern Hills, c. 25 miles [40.2 km] W of Blackall, May 1949, *Everist* 3807 (BRI). SOUTH KENNEDY DISTRICT: 8 miles [12.9 km] W of 'Avon Downs' Station, Jul 1964, *Adams* 1048 (BRI, CANB); 120 km NW of Clermont, 22°03'S, 147°06'E, Jul 1977, *Dale* 153 (BRI). LEICHHARDT DISTRICT: 85 km SW of Mackay, 37 km NW from Peak Downs Highway along Suttor Development Road, 21°33'S, 148°21'E, May 1990, *Halford* Q177 (BRI); 64 km W of Emerald along Capricorn Highway, 23°35'S,

147°39'E, May 1990, *Halford* Q294 (BRI); 'Codenwarra', 8 miles [12.9 km] E of Emerald, 1978, *Godwin* AC214 (BRI). PORT CURTIS DISTRICT: Gracemere, Feb 1869, *O'Shanesy* 1059 (MEL). WARREGO DISTRICT: 'Airlie', Wyandra, 120 km S of Charleville, Mar 1984, *Silcock* s.n. [AQ399745] (BRI).

Distribution and habitat: *O. coerulescens* is found across central Queensland from Urandangie to Rockhampton and south to Wyandra (**Map 7**). It grows on heavy clay soils mostly in *Astrebula* spp. grasslands, mixed herblands and *Acacia* spp. woodlands.

Conservation status: This species is not considered rare or threatened at present.

Typification: When Mueller (1863) described *Hedyotis coerulescens* he referred to material that he would have collected on the final stages of the Gregory Expedition of Northern Australia in late 1856. There are two sheets at MEL labelled as 'Type specimens' for *Hedyotis coerulescens*. MEL 61480 has a single element and an annotation in Mueller's hand 'Peak Downs, scrub and plains [illegible word]'. There is a sheet at Kew which is a duplicate of the MEL 61480 consisting of two elements with a label in Mueller's hand 'Peak Downs'. The other MEL specimen (MEL 61479) consists of five elements all of this species and has two labels in Mueller's hand. One in the bottom right has 'Issacs River, Bowman' the other in the top left has 'Nichol Bay W.A. 1876'. It seems highly unlikely that this second label belongs to any of the material on the sheet as *Hedyotis coerulescens* has not been collected any further west than Urandangie, Queensland. As the material is undated and Mueller did not refer to any Bowman material in his protologue there is doubt that it was part of the original material that Mueller used in drawing up his circumscription of the species. The MEL sheet MEL 61480 is here designated as lectotype as it is part of the original material and agrees with the original description.

Notes: Bentham (1866) in his treatment of this species under *Hedyotis* notes that it 'is closely allied to the East Indian *Hedyotis maritima* [= *Hedyotis graminifolia* L. f.] and further specimens may possibly show it to be a variety only'. Although the habit and capsule shape are similar in both taxa, a close examination of *H. graminifolia* show it to be quite distinct in flower structure and seed morphology.

10. *Oldenlandia crouchiana* (F. Muell.) F. Muell., Syst. cens. Austral. pl. 74 (1882); *Hedyotis crouchiana* F. Muell., Fragm. 10: 85 (1876). Type: [Western Australia. FORTESCUE DISTRICT:] Nichol Bay, 1876, *Mrs Crouch* (holo: MEL(MEL 61481); iso: K).

Low spreading to erect annual herbs, to 20 cm high, much branched from base; branchlets stout, somewhat woody, tetragonous to tetraquetrous, 4-ribbed, glabrous except for laterally compressed conical hairs on ribs. Leaves narrowly lanceolate or narrowly elliptic, 15–40 mm long, 3–8 mm wide, glabrous or sparsely covered with scabrous hairs above, on margin and on midrib below, attenuate at base, acute to acuminate at apex. Stipule-sheath 1–2 mm long, glabrous or with erect, triangular hairs, truncate or produced into triangular lobe; margin with 2–8 laciniae. Inflorescences terminal cymes; peduncles once or twice dichasially branched with each ultimate branch ending in monochasial cymes; pedicels 2–8 mm long; bracts leaf-like up to 15 mm long. Calyx-tube obloid, 2.0–3.5 mm long, 1.5–2.0 mm wide, glabrous, smooth or papillose; lobes ovate, 2.5–4.5 mm long, glabrous or sparsely covered with scabrous hairs, joined at base to form a free tube. Corolla blue; tube 1.0–1.5 mm long, glabrous at throat; lobes linear or narrowly obovate, 3.0–6.5 mm long, geniculate at c. 1/5 of their length from tube, with a dense transverse line of hairs on lobes at knee. Filaments 0.3–0.5 mm long; anther oblong, 0.5–1.0 mm long. Ovules c. 40–50 per locule. Style 1.0–1.5 mm long; stigma bifid; lobes erect, c. 1 mm long, subulate. Stamens and style exerted from corolla tube but enclosed by lobes, overtopped by ring of hairs. Capsule obloid, 3.5–6.0 mm long, 3.5–4.5 mm wide, glabrous or with laterally compressed conical hairs along vascular traces, furrowed along dissepiment; calyx lobes erect; beak c. 0.7 mm long, truncate, not protruding above calyx lobes. Seeds numerous, cerebriform, depressed ovate in outline; surface black, reticulate-foveate.

Selected specimens: Western Australia. DAMPIER DISTRICT: 1 km S of Geikie Gorge, Geikie Hills, 18°05'S, 125°42'E, Apr 1988, *Cranfield* 6422 (PERTH); Gogo Station, Fitzroy Crossing, May 1962, *Royce* 7009 (PERTH). FORTESCUE DISTRICT: 2 km NE of campsite, Barrow Island, 20°49'S, 155°25'E, Jun 1964, *Goodall* 1302 (PERTH); Dampier Archipelago, NW Roebourne, Jun 1962, *Royce* 7341 (PERTH); near old construction camp, Shay Gap,

c. 160 km E of Port Headland, 20°30'40"S, 120°08'40"E, Jul 1984, *Newbey* 10295 (PERTH); Hamersley Range, near Mt Rica, Oct 1941, *Gardner* 6400 (PERTH); 1 mile [1.6 km] E of Millstream Homestead, Mar 1962, *George* 3538 (PERTH); 88.9 km S of Marble Bar on track to Nullagine, 21°42'S, 120°12'E, Jun 1981, *Kenneally* 7685 (PERTH); 19 km SSW of Tanguin Hill, c. 135 km SE of Shay Gap, 21°00'00"S, 121°08'30"E, Jul 1984, *Newbey* 10548 (PERTH); Duck Creek, 8 km NE of Quarry Hill, c. 120 W of Tom Price, 22°28'10"S, 116°37'50"E, Aug 1984, *Newbey* 10664 (PERTH); Mount Brockman Station, Aug 1973, *Demarz* 4423 (PERTH); Kalamina Gorge, Wittenoom area, May 1966, *Blockley* 221 (PERTH); Shale Ridge, Newman, Jul 1981, *Deighton* 99 (PERTH). CARNARVON DISTRICT: North West Cape, lighthouse hill, Aug 1960, *George* 1398 (PERTH). ASHBURTON DISTRICT: Barlee Range, Henry River, 23°44'S, 116°19'E, Aug 1961, *Royce* 6496 (PERTH). KEARTLAND DISTRICT: near Rudall River, May 1971, *George* 10690 (PERTH); Rudall River area, 22°35'S, 122°10'E, Aug 1971, *Wilson* 10556 (PERTH).

Distribution and habitat: *O. crouchiana* occurs in the north west of Western Australia from Cape Range to near Fitzroy Crossing (**Map 8**). It grows on shale ridges and basalt hills in well drained gravelly and sandy soils in hummock grasslands, and along drainage lines in gravelly to sandy loams in *Eucalyptus camaldulensis* low woodlands.

Conservation status: This species is not considered to be rare or threatened at present.

11. Oldenlandia spathulata Halford, **sp. nov.** arcte affinis *O. crouchiana* a qua distiguenda corollae lobis spathulatis et capsulis eius obloido-ellipsoidalibus, 6–9 mm longis, 3–4 mm latis, vice capsulis *O. crouchiana* obloideis, 3.5–6.0 mm longis, 3.5–4.5 mm latis. **Typus:** Queensland. BURKE DISTRICT: Along Donors Hill – Burketown road. Upper Alexandra River (Landsborough R.) branch of the Leichhardt River near 'Talawanta', 18°37'S, 140°15'E, 26 April 1974, *R. Pullen* 8916 (holo: BRI; iso: CANB).

Ascending to erect annual herbs to 30 cm high, branched from base; branchlets tetragonous, glabrous, smooth or tuberculate along ribs. Leaves sessile, linear or linear-lanceolate, 25–60 mm long, 2–6 mm wide, glabrous, attenuate at base, acute at apex. Stipule-sheath 1–1.5 mm long, glabrous, fimbriate on margin. Inflorescences terminal cymes; peduncles once or twice dichasially branched with each ultimate branch ending in monochasial cymes. Flowers usually borne in pairs at nodes on unequal pedicels; pedicels stout, 2–2.5 mm long, glabrous; bracts leaf-like up to 20 mm long, 1 mm wide. Calyx-tube obloid, 2.0–4.0 mm long, 1.5–2.0 mm wide, glabrous; lobes ovate, 1–2 mm long, joined at base to form a free tube, colleters present between lobes. Corolla pale blue, glabrous outside; tube short, 0.5–1.0 mm long, glabrous inside, flat undulate outgrowths from corolla tube in throat; lobes spathulate, 6–8 mm long, 2.0–2.5 mm wide; margin pilose with long moniliform hairs. Stamens exserted; filaments 4–5 mm long, attached at sinus between lobes; anthers oblong, 1.5–2.0 mm long. Ovules numerous in each locule. Style 5.0–7.0 mm long; stigma bifid; lobes obtuse, 0.3–0.8 mm long, reflexed at apex. Capsule obloid-ellipsoidal, 6.0–9.0 mm long, 3.0–4.0 mm wide, glabrous, furrowed along dissepiment; calyx lobes erect, recurved at apex; beak rounded, c. 1 mm long, not protruding above calyx lobes. Seeds numerous, cerebriform, depressed obovate in outline, 0.5–0.7 mm wide; surface black, verrucate. **Figs 1F & 5A–D.**

Specimens examined: Queensland. BURKE DISTRICT: Alexandra River crossing along road to Burketown, Talawanta Station, 18°37'S, 140°16'E, Jun 1991, *Halford* Q466 (BRI).

Distribution and habitat: *O. spathulata* is only known from the type locality on Talawanta Station, Queensland (**Map 8**). It grows in a low open eucalypt woodland with annual grasses on a grey silty clay soil.

Distinguishing features: *O. spathulata* is closely related to *O. crouchiana*. It can be distinguished from this species by its spathulate corolla lobes, and longer obloid-ellipsoidal capsule, 6–9 mm long, 3–4 mm wide as compared to the obloid capsule, 3.5–6 mm long, 3.5–4.5 mm wide of *O. crouchiana*.

Conservation status: I have been unable to find any more populations of this species during two field trips (April 1989 and May 1990) to the area. The area for several years has had well below average rainfall which has produced poor seasons for annuals. Further field studies during more conducive wet seasons are required to ascertain its full distribution. A conservation coding of 1K is considered appropriate.

Etymology: The specific epithet refers to the shape of the corolla lobes.



Fig. 5. *Oldenlandia spathulata*: A. habit $\times 0.4$. B. side view of capsule $\times 4$. C. flower $\times 4$. D. corolla opened out $\times 4$. *Oldenlandia kochiae*: E. side view of capsule $\times 8$. F. branchlet of inflorescence $\times 1$. A, Pullen 8916; B-D, Halford Q466; E, F, Carr 3100 & Beauglehole 416859.

- 12. *Oldenlandia spermacocoides*** (F. Muell.) F. Muell., Syst. cens. Austral. pl. 74. (1882); *Hedyotis spermacocoides* F. Muell., Fragm. 8: 146 (1874) (as 'spermacociodes').
Type: Sturt's Creek, Feb 1856, *F. Mueller* (holo: MEL(MEL 61486)).

Compact procumbent or ascending annual herbs to 30 cm high; branchlets tetragonous, 4-ribbed, hispidulous to hispid, or rarely glabrous. Leaves sessile linear, narrow elliptic or oblanceolate, 15–35 mm long, 1–8 mm wide, hispid or rarely papillose on upper and lower surfaces, attenuate at apex and base. Stipule-sheath c. 1 mm long, truncate with 1–3 fimbriae or produced into triangular lobe sometimes deeply divided. Inflorescences axillary or terminal fascicles, 3–8-flowered, rarely 1 or 2 or more than 8; pedicels 1–4 mm long. Calyx-tube subglobose, c. 1.5 mm diameter, hispid or papillose; lobes triangular, 3–4 mm long, keeled, hispid or papillose. Corolla white, hispidulous outside; tube short, 0.5–1.5 mm long, glabrous at throat; lobes 1.5–2.5 mm long, geniculate at c. 1/4 of their length from the tube, with a transverse line of hairs on lobes at knee. Filaments c. 1 mm long; anthers oblong, c. 0.8 mm long. Ovules 15–20 per locule. Style 1.5–2.0 mm long; stigma bifid; lobes short. Stamens and style exerted from corolla tube but enclosed by lobes, overtopped by ring of hairs. Capsule subglobose, 2–4 mm long, 2.5–4.5 mm wide, laterally compressed, furrowed along dissepiment, or hispid rarely papillose; calyx lobes erect, recurved at apex; beak truncate, not protruding above calyx lobes. Seeds numerous, cerebriiform, depressed obovate in outline, c. 1 mm wide; surface dark reddish brown, reticulate-foveate. **Figs 1E & 3A & B.**

Selected specimens: Western Australia. GARDNER DISTRICT: Mitchell River, 14°50'S, 125°42'E, Feb 1980, *Dunlop* 5286 (BRI,DNA,PERTH); c. 15 km N of Kalumburu Mission, 14°11'S, 126°41'E, May 1983, *Fryxell & Craven* 4126 (PERTH); King Edward River, old CRA campsite, 1 km S of track to old Mitchell River Station, 15°08'S, 126°09'E, Jun 1988, *Edinger* 543 (PERTH); Hidden Valley, just E of Kununurra, Apr 1977, *George* 14534 (PERTH). HALL DISTRICT: Piccaninny Creek Gorge, 15 km SE of Bungle Bungle Outcamp, Bungle Bungle Range, 17°27'S, 128°25'E, Apr 1985, *Blackwell* BB17 (PERTH). Northern Territory. VICTORIA RIVER REGION: 33 km E of Kununurra, Aboriginal Painting site, Keep River National Park, 15°48'S, 129°02'E, Apr 1989, *Halford* H56 (BRI); Upper Victoria River, Jan 1856, *Mueller* s.n. (K); 7 km N Mt Sanford Station, 16°56'S, 130°35'E, [date not recorded], *Latz* 5345 (AD,DNA); Victoria River Crossing, 16°20'S, 131°07'E, May 1968, *Byrnes* NB715 (DNA).

Distribution and habitat: *O. spermacocoides* occurs from the Mitchell River, Western Australia east to the Victoria River, Northern Territory (**Map 8**). It grows chiefly on shallow sandy soils on creek levees or rocky slopes associated with sandstone outcrops, hills and escarpments in open woodlands.

Conservation status: This species is not considered to be rare or threatened at present.

Notes: *O. spermacocoides* is closely related to *O. crouchiana*. It is easily distinguished by its fasciculate inflorescences and subglobose capsules. The typical form of this species has branchlets, leaves and capsules covered with a hispid indumentum. Plants from King Edward River (*Edinger* 372 & 543) and Pauline Bay (*Forbes* 2168) have glabrous branchlets and leaves and capsules covered with a short papillose indumentum.

Mueller in the protologue and on specimens he examined spelt the specific epithet 'spermacociodes'. Later in his 'Systematic Census of Australian Plants' (1882) he used the spelling 'spermacocoides' without giving any explanation for the change. The derivation of the specific epithet comes from the genus *Spermacoce*, and the latin suffix *-oides* resemblance, alluding to the resemblance of the taxon to some species of the genus *Spermacoce*. I am uncertain what Mueller had in mind with his early spelling. The spelling 'spermacocoides' should be used in accordance with article 73.8 of the International Code of Botanical Nomenclature (1983) which allows the incorrect compounding form of an epithet to be corrected.

- 13. *Oldenlandia kochiae*** Halford, **sp. nov.** olim confusa *O. mitrasacmoide* a qua habitu infirme ascendente, semenibus obconicis et floribus capsulisque parvioribus facile distiguenda. **Typus:** Western Australia: Angustus Island, Bonaparte Archipelago, 15°25'S, 124°35'E, 15 May 1972, *P.G. Wilson* 10806 (holo: PERTH).

Weakly ascending herbs to 40 cm high; branchlets weakly ribbed, glabrous, smooth or tuberculate on ribs. Leaves sessile, linear 20–40 mm long, 0.5–1.0 mm wide, glabrous or sparsely covered with minute scabrous hairs, attenuate at base and apex. Stipule-sheath c. 1 mm long, glabrous, produced into lobe usually deeply divided. Inflorescences terminal, paniculiform cymes; peduncles once or twice dichasially branched with each ultimate branch ending in monochasial cymes. Flowers borne mostly in pairs at nodes,

on \pm equal pedicels; pedicels slender, 5–15 mm long; bracts small subulate, 1–3 mm long. Calyx-tube hemispherical, c. 1 mm diameter, glabrous; lobes broadly triangular, c. 0.5 mm long, glabrous. Corolla mauve or white, glabrous outside; tube 0.5–1.0 mm long; bearded at throat; lobes broadly triangular, 1.0–1.5 mm long. Stamens included; anthers subsessile, globose, c. 0.2 mm long. Ovules numerous in each locule. Style c. 0.2 mm long; stigma narrowly conical, 0.5 mm long. Capsule subglobose 2.0–2.5 mm diameter, laterally compressed, slightly furrowed at dissepiment; calyx lobes erect; beak c. 1 mm long, rounded, protruding above calyx lobes. Seeds numerous depressed obconic, c. 0.5 mm wide, obtriangular in outline; surface brown, reticulate-areolate. **Fig. 5E & F.**

Specimens examined: Western Australia. GARDENER DISTRICT: Bat Island, Jun 1973, *Wilson* 10976 (PERTH); Heywood Island (South Island), Bonaparte Archipelago, May 1972, *Wilson* 10911 (PERTH); Spillway Creek area, outflow of Lake Argyle, Jul 1974, *Carr* 3100 & *Beaughole* 46859 (PERTH).

Distribution and habitat: *O. kochiae* occurs on the islands in the Bonaparte Archipelago and near Kununurra, Western Australia. (**Map 7**). It has been recorded growing amongst rocks on the beach (*Wilson* 10911).

Conservation status: *O. kochiae* is a poorly known species. A conservation coding of 3K is appropriate.

Etymology: The species is named in honour of Mrs B. Koch of Perth who in the Flora of the Kimberley Region recognized it as a distinct taxon.

Notes: *O. kochiae* has been previously confused with *O. mitrasacmoides* but is easily distinguished by its weakly ascending habit, its obconic seeds, and its smaller flowers and capsules.

14. *Oldenlandia mitrasacmoides* (F. Muell.) F. Muell., Syst. cens. Austral. pl. 74 (1882); *Hedyotis mitrasacmoides* F. Muell., Fragm. 4: 37 (1863). **Type:** [Northern Territory. VICTORIA RIVER REGION:] Depot Creek, March 1856, *F. Mueller* (lecto (here designated): K; islecto: MEL(1551047)).

Hedyotis trachymenoides F. Muell., Fragm. 4: 40 (1863); *Oldenlandia trachymenoides* (F. Muell.) F. Muell., Syst. cens. Austral. pl. 74 (1882); *Anotis trachymenoides* (F. Muell.) Domin, Biblioth. Bot. 89: 616 (1929). **Type:** [Queensland.] Dawson River, *F. Mueller*, (lecto (here designated): K; islecto: MEL(61488)).

Ascending to erect annual herbs to 90 cm high, unbranched or much branched from the base; branchlets terete or weakly ribbed, moderately hispidulous or glabrous. Leaves sessile, linear, 15–70 mm long, 0.2–2.0 mm wide, glabrous or sparsely hispidulous, attenuate at base, acute to acuminate at apex, recurved at margin. Stipule-sheath c. 1 mm long, produced into triangular lobe sometimes deeply divided; margin entire. Inflorescences lax terminal, paniculiform cymes; peduncles unbranched or irregularly dichasially branched with each ultimate branch ending in monochasial cymes. Flowers paired (rarely 1 or 3) at nodes on \pm equal pedicels; pedicels 0.5–2.5 cm long; bracts leaf-like, up to 10 mm long. Calyx-tube subglobose, 1–2 mm diameter, glabrous; lobes triangular, 0.5–1.0 mm long, smooth or scabridulous on margin, colleters sometimes present between lobes. Corolla white to pale mauve, cylindrical glabrous outside; tube 1–6(9) mm long, bearded at throat; lobes ovate or elliptic, 1–4(6) mm long. Stamens partly or completely exserted from corolla tube; filaments 0.3–0.5 mm long; anthers linear-oblong, 0.5–1.5 mm long. Ovules numerous in each locule. Style (0.2)1.5–7.0 mm long; stigma scarcely bifid or capitate, rarely narrowly conical, usually exserted from corolla tube, rarely included. Capsule subglobose to depressed obovoid or obovoid-globose, 1.5–3.0 mm long, 2.0–4.0 mm wide, glabrous, slightly furrowed at dissepiment; calyx lobes erect; beak broad, 0.5–1.0 mm long rounded, equal to or protruding above calyx lobes. Seeds numerous, scutelliform, oblong to broadly elliptic in outline; surface brown or black, reticulate or reticulate-areolate.

Notes: *Oldenlandia mitrasacmoides* as circumscribed here includes the taxon *Oldenlandia trachymenoides* F. Mueller.

O. mitrasacmoides and *O. trachymenoides* were separated by Mueller (1863) on the basis of the corolla length and capsule shape. From the herbarium material examined it became apparent that these characters vary over the range of the taxa. Populations in

the Burke and Cook Pastoral Districts of Queensland are difficult to place as they are somewhat intermediate between the types.

Three subspecies are recognised.

1. Capsules ovoid-globose, 2.5–3.0 mm long, 2.0–3.0 mm wide. NT, Qld
 subsp. **nigricans**
 Capsules subglobose to depressed obovoid, 1.5–2.5 mm long, 2.0–3.5 mm
 wide 2
2. Corolla tube 1.2–3.0 mm long, usually no more than twice the length of
 the calyx lobes; rim of seeds distinctly incurved; capsule subglobose.
 WA, NT, Qld subsp. **mitrasacmoides**
 Corolla tube 3.0–6.5 mm long, at least 3 times the length of the calyx
 lobes; rim of seeds only slightly incurved; capsule transversely ovoid.
 Qld subsp. **trachymenoides**

14a. *Oldenlandia mitrasacmoides* (F. Muell.) F. Muell. subsp. *mitrasacmoides*

Erect to ascending herbs to 50 cm tall, mostly very little branched from base; stems terete or slightly ribbed, glabrous or hispidulous. Leaves 30–70 mm long, up to 1 mm wide. Corolla white or pale mauve; tube 1.2–3.0 mm long, usually no more than twice the length of the calyx lobes; lobes ovate-triangular, 1.0–3.0 mm long. Style 1.5–3.0 mm long. Capsule subglobose, 1.5–2.5 mm long, 2.0–3.0 mm wide. Seeds oblong in outline, 0.5–0.7 mm wide; rim thick, incurved; surface dark brown, reticulate-areolate. **Figs 1B & 6D & E.**

Selected specimens: Western Australia. DAMPIER DISTRICT: between Broome and Crab Creek, Mar 1985, *Foulkes* 188 (PERTH). FITZGERALD DISTRICT: 95 km W along the Gibb River road from the Great Northern Highway, c. 72 km SW of Wyndham, Apr 1989, *Halford* H28 (BRI,PERTH). GARDNER DISTRICT: Valentine's Spring, c. 11 km NW of Kununurra, Apr 1989, *Halford* H19 (BRI,PERTH); near Kimberley Research Station, Ord River, Apr 1958, *Burbidge* 5705 (CANB); 8 km SE of Kununurra, Mar 1978, *Paijmans* 2415 (CANB,PERTH); 1.5 km W of Lake Argyle turn-off on Kununurra – Timber Creek road, c. 33 km SE of Kununurra, Apr 1989, *Halford* H17 (BRI,DNA,MEL,PERTH). Northern Territory. DARWIN AND GULF REGION: c. 37 miles [59.5 km] NE of Maranboy Police Station, Mar 1965, *Lazarides & Adams* 30 (CANB,DNA); 17 miles [27 km] E of Pine Creek, *Nelson* 289 (BRI,DNA,MEL,NSW); Blain, 19 miles [30.6 km] S of Katherine, Nov 1961, *McKee* 8436 (CANB,DNA,NSW). VICTORIA RIVER REGION: Jasper Gorge, Apr 1989, *Halford* H63 (BRI,DNA). BARKLY TABLELANDS REGION: 24 km NE of Cape Crawford along road to Borroloola, Apr 1989, *Halford* H94 (BRI,DNA,K,MEL); c. 27 km SW of 'Calvert Hills' on the road to 'Creswell Downs', May 1974, *Pullen* 9253 (BRI,CANB). CENTRAL NORTHERN REGION: Woggles Waterhole, Kurundi Station, Sep 1983, *Latz* 9783 (DNA). Queensland. BURKE DISTRICT: Smith's Range, 118 km NE of Camooweal on Camooweal – Gregory Downs road, May 1989, *Halford* H98 (BRI); c. 15 km SW of Normanton on the road to 'Mogoura' Station, Apr 1974, *Pullen* 8879 (CANB,DNA); 50 km SE of Normanton along Gulf Development road, May 1990 *Halford* Q270 (AD,BRI,NSW). COOK DISTRICT: Davies Creek N.P., 1 km past car park, Jun 1991, *Forster* PIF8468 (BRI,DNA,MEL); c. 10 km W of Georgetown along Gulf Development road, near old smelter site, May 1990, *Halford* Q249 (BRI,DNA,MEL).

Distribution and habitat: *O. mitrasacmoides* subsp. *mitrasacmoides* is widespread in northern Australia, from the Kimberley Region, Western Australia to north eastern Queensland (**Map 9**); grows in a wide range of habitats on sandy, clay or gravelly soils on plains, river levees or rocky hills in open heaths, grasslands, woodlands or open forests.

Typification and Notes: *Hedyotis mitrasacmoides* was described by Mueller from specimens he collected on the Gregory Expedition of Northern Australia. A specimen at MEL (MEL 1551047) has a label in Mueller's hand 'Hedyotis mitrasacmoides, Depot Creek, F. v. Mueller'; this consists of a single plant with mature capsules and seed. At Kew there are three specimens on a single sheet. The two on the left of the sheet have a label in Mueller's hand 'Hedyotis mitrasacmoides, Depot Creek, March 1856, F. v. Mueller'. These two plants have flowers, capsules and seed present. The single specimen on the right of the sheet has a label in Mueller's hand 'Hedyotis mitrasacmoides, F. v. Mueller, not uncommon in tropical Australia but this the only specimen in this collection'. This specimen does not agree with Mueller's protologue description of capsule shape. The material at Kew collected by Mueller from Depot Creek is selected as lectotype because it agrees with the protologue, has flowers, fruits and seeds. The MEL material is regarded as a isoelectotype.

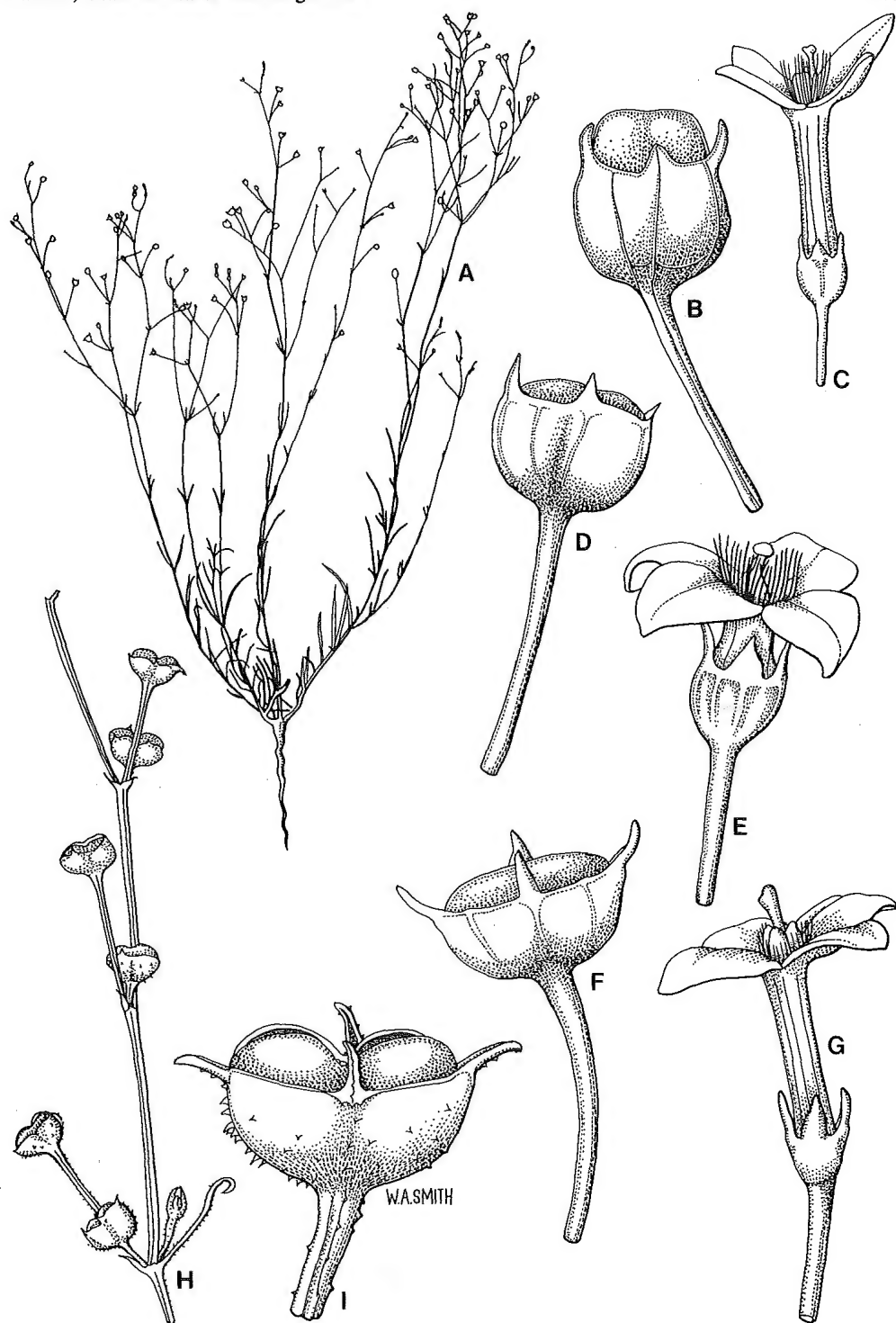


Fig. 6. *Oldenlandia mitrasacmoides* subsp. *nigricans*: A. habit $\times 0.33$. B. side view of capsule $\times 8$. C. flower $\times 8$. *Oldenlandia mitrasacmoides* subsp. *mitrasacmoides*: D. side view of capsule $\times 8$. E. flower $\times 8$. *Oldenlandia mitrasacmoides* subsp. *trachymenoides*: F. side view of capsule $\times 8$. G. flower $\times 8$. *Oldenlandia pterospora*: H. single inflorescence branchlet $\times 2$. I. side view of capsule $\times 8$. A,B, Specht 300; C, Clarkson 6803 & McDonald; D,E, Halford H14; F,G, Halford Q617; H,I, Dunlop 2579.

Generally the stigma is shortly bifid and is exerted from the corolla tube. There are a number of specimens from the Kimberley region (*Broadbent* 658; *Foulkes* 79; *Carter* 365) that have conical stigmas that are included. It is impossible to distinguish between this and the typical *O. mitrasacmoides* without flowers. More collections are needed to ascertain whether or not this is a distinct taxon or a variant of *O. mitrasacmoides*.

14b. *Oldenlandia mitrasacmoides* subsp. *trachymenoides* (F. Muell.) Halford, *comb. et stat. nov.*

Hedyotis trachymenoides F. Muell., *Fragm.* 4: 40 (1863); *Oldenlandia trachymenoides* (F. Muell.) F. Muell., *Syst. cens. Austral. pl.* 74 (1882); *Anotis trachymenoides* (F. Muell.) Domin, *Biblioth. Bot.* 89: 616 (1929). **Type:** [Queensland.] Dawson River, *F. Mueller* (lecto (here designated): K; isolecto: MEL(MEL 61488)).

Ascending herbs, to 40 cm high, stems ribbed, hispidulous near base. Leaves 15–35 mm long, up to 1 mm wide. Corolla white; tube 3–6(9) mm long, mostly 3 times the length of calyx lobes; lobes ovate, 1.5–3.0(6) mm long. Style 3.5–10 mm long. Capsule depressed obovoid, 1.7–2.0 mm long, 3.0–3.5 mm wide. Seeds broadly elliptic in outline, 0.7–0.9 mm wide; rim thin, slightly incurved; surface dark brown, reticulate-foveate. **Figs 1C & 6F & G.**

Selected specimens: Queensland, NORTH KENNEDY DISTRICT: 15 km N of Charters Towers towards The Lynd Junction, May 1989, *Halford* H130 (AD,BRI,NSW); c. 45 km WSW of Charters Towers along Flinders Highway, towards Hughenden, Apr 1989, *Halford* H3 (BRI,DNA,K,MEL,PERTH). MITCHELL DISTRICT: 22 km NW of Longreach along Landsborough Highway, May 1990, *Halford* Q284 (BRI,CANB,K,NSW); 6 km E of Barcardine along road towards Jericho, May 1990, *Halford* Q286 (BRI,K,MEL). SOUTH KENNEDY DISTRICT: 122 km S of Charters Towers along Gregory Development road, Cape River crossing, May 1990, *Halford* H199 (BRI,CANB,MEL); 1 km N of Belyando River crossing on Gregory Development road, c. 43 km W of Mt Coolon, May 1990, *Halford* Q197 (AD,BRI,L,MEL); 3 miles [4.8 km] E of Mt Coolon T/S, *Adams* 1109 (BRI,CANB,NSW). LEICHHARDT DISTRICT: 14.8 km S of Peak Downs Highway along Fitzroy Development road, c. 26 km SW of Nebo, May 1990, *Halford* Q175 (BRI,K,L,MEL). PORT CURTIS DISTRICT: Mt Slopeaway, Marlborough – Sarina road, Mar 1989, *Reeves* 612 (BRI); S end of Curtis Island, Dec 1929, *Mackenzie* [AQ124570] (BRI). BURNETT DISTRICT: 30 km NNE of Gayndah, Dec 1972, *Pedley* 4011 (BRI). DARLING DOWNS DISTRICT: 'Rockwood' c. 20 miles [32.2 km] SW of Chinchilla, Nov 1969, *Pedley* s.n. [AQ124654] (BRI); Marmadua S.F., 45 miles [72.4 km] WSW of Dalby, Feb 1962, *Pedley* 958 (BRI).

Distribution and habitat: *O. mitrasacmoides* subsp. *trachymenoides* is known from near Charters Towers, north-east Queensland extending south to the Darling Downs (**Map 9**). It grows in eucalypt forests, *Acacia* shrublands or cypress woodlands on a range of soil types.

Typification and Notes: In the protologue of *Hedyotis trachymenoides*, Mueller cited two collections; his own collection from the Dawson River and a collection made by Bowman from Issacs River. There is a specimen at Kew collected by Mueller from the Dawson River. It has capsules, flowers and seeds and agrees with the protologue description. There is a small fragment in MEL (MEL 61488) of Mueller's collection from the Dawson River. No specimens of Bowman's were located, although there is a specimen at MEL (MEL 61487), without the collector recorded from the Issacs River. The Kew sheet is chosen as lectotype because it is part of the original material and is a better specimen than the fragment at MEL which is regarded as a isolectotype.

Mueller in the protologue and on specimens he had examined spelt the epithet 'trachymenoides'. In his first and second edition of the Systematic Census of Australian Plants he spelt the epithet 'trachymenioides'. This spelling was later taken up by Bailey (1900). As the original spelling is orthographically correct there is no reason under the International Code of Botanical Nomenclature (1983) to change the spelling and the original spelling should be retained.

14c. *Oldenlandia mitrasacmoides* subsp. *nigricans* Halford, *subsp. nov.* corollae tubo longo *O. mitrasacmoidi* subsp. *trachymenoidi* similis, et seminum margine angusto crasso subsp. *mitrasacmoidi* similis, sed habitu plerumque altiore erecto, capsulo oblongo-globoso et planta in sicco nigrescente facile distinguenda. **Typus: Northern Territory. Hemple Bay, Groote Eylandt, in the Gulf of Carpentaria, 28 April 1948, *R.L. Specht* 300 (holo: BRI; iso: AD,CANB,DNA,MEL,NSW,PERTH).**

Erect herbs to 90 cm high, usually much branched at the base; branchlets terete sometimes slightly ribbed, hispidulous or rarely glabrous. Leaves 10–60 mm long, 1–2 mm wide.

Corolla pale mauve; tube 2.5–6.0 mm long, mostly 3 times the length of calyx lobes; lobes ovate to elliptic, 1.5–4.0 mm long. Style 3.5–7.0 mm long. Capsule ovoid-globose, 2.5–3.0 mm long, 2.0–3.0 mm wide, wide; calyx lobes erect; beak 0.5–1.0 mm long, truncate, \pm equal to or longer than calyx lobes. Seeds oblong in outline, 0.6–0.8 mm wide; rim thick, incurved; surface black, reticulate-foveate. **Fig. 6A–C.**

Selected specimens: Northern Territory. DARWIN AND GULF REGION: Little Lagoon, Groote Eylandt, in the Gulf of Carpentaria, Apr 1948, *Specht* 232 (AD,BRI,CANB,MEL,NSW). Queensland. COOK DISTRICT: Between Pine River Basin and Gulf coast, N. of Duyfken Point, 12°27'S, 141°37'E, Feb 1981, *Morton* AM1117 (BRI); 1 km S of Archer River Roadhouse, 13°26'S, 142°57'E, Apr 1988, *Forster* 4251 & *Liddle* (BISH,BRI,DNA,LAE); 2 km S of the Big Coleman River on the Coen to Musgrave road, 14°35'S, 143°25'E, May 1987, *Clarkson* & *Simon* 7123 (BRI); c. 35 km NW of Cooktown on road to 'Battle Camp', May 1989, *Halford* H121 (BRI,DNA,K,MEL,PERTH); 10 km S of Laura on the Peninsula Development Road, 15°37'S, 144°37'E, Jun 1981, *Clarkson* 3675 (BRI); Bloodwood Lagoon, 16 miles [25.7 km] S of Dunbar (which is about 60 miles [96 km] S.E. of mouth of Mitchell River), 16°03'S, 142°23'E, undated, *Whitehouse* [AQ124573] (BRI); 47.5 km along road to Bulimba Stn, off Chillagoe to Wrotham Park road, 17°00'S, 143°56'E, Jun 1991, *Forster* PIF8411 (BRI,DNA,K,MEL); 24 km S of Einasleigh on the road to The Lynd Junction, May 1990, *Halford* Q248 (BRI,K,L). MITCHELL DISTRICT: Barcaldine, Apr 1919, *White* [AQ124577] (BRI).

Distribution and habitat: *O. mitrasacmoides* subsp. *nigricans* occurs from Cape York Peninsula south to Barcaldine, central Queensland with one record from the north east of the Northern Territory (**Map 1**). It grows mostly in eucalypt woodlands and forests on sandy soils.

Distinguishing features: This subspecies has a long corolla tube similar to subsp. *trachymenoides* and a narrow thick rim to its seed similar to subsp. *mitrasacmoides*, but is easily distinguished by its usually taller erect habit, ovoid-globose capsule and the plant turning black when dry.

Conservation status: This subspecies is not considered to be rare or threatened at present.

Etymology: The specific epithet alludes to the black colour of the plants when dried.

15. *Oldenlandia pterospora* (F. Muell.) F. Muell., Syst. cens. Austral. pl. 74 (1882); *Hedyotis pterospora* F. Muell., Fragm. 4: 40 (1863). **Type:** Sturt's Creek, February 1856, *F. Mueller* (holo: MEL(MEL 61485); iso: K).

Ascending to erect ephemeral herbs, to 40 cm high, much branched from base; branchlets ribbed, scabrous, hispidulous. Leaves sessile, linear, 15–45 mm long, 0.7–4.0 mm wide, hispidulous on the upper surface and on the midrib below, acute at apex; margin revolute. Stipule-sheath 0.5–1.5 mm long, truncate or produced into single lobe, entire or with 1–3 fimbriae on margin. Inflorescences terminal, panicleiform cymes; peduncles irregularly dichasially branched with each ultimate branch ending in monochasial cymes. Flowers borne in pairs, on unequal stout pedicels, 1st pedicel 2–5 mm long, 2nd pedicel 5–15 mm long, hispidulous; bracts subulate, 2–4 mm long. Calyx-tube turbinate, 1.0–1.5 mm long, 1.5–2.0 mm wide, hispidulous; lobes triangular, 0.7–1.7 mm long. Corolla white, cylindrical; tube 1.5–3.3 mm long, densely hairy at throat; lobes ovate, 1–3 mm long. Filaments 0.25–0.5 mm long; anthers oblong, 0.5–0.8 mm long, partly exserted from throat. Ovules 2–6 per locule. Style 2.5–4.7 mm long, exserted; stigma bifid. Capsule depressed obovoid, 2–3 mm long, 3–4 mm wide, deeply furrowed along dissepiment, sparsely hispidulous with laterally flattened conical hairs; calyx lobes erect, recurved at apex; beak emarginate, 0.5–0.8 mm long, protruding above calyx lobes. Seeds 4–8 per capsule, meniscoid, broadly elliptic in outline, 1.8–2.7 mm long, 1.0–1.5 mm wide; surface light brown, shiny, reticulate-areolate. **Fig. 1D & 6H & I.**

Selected specimens: Western Australia. CANNING DISTRICT: N of Dragon Tree Soak, Great Sandy Desert, Aug 1977, *George* 14775 (PERTH); Great Sandy Desert, 20°21'S, 122°04'E, May 1979, *Mitchell* 1170 (AD,PERTH); Great Sandy Desert, 20°45'S, 123°30'E, Apr 1964, *Beard* 3248 (PERTH); 2 km W of Thomas Peak, 20° 53'S, 128°05'E, Jul 1981, *Cane* 91 (DNA); Edge of Great Sandy Desert, 21°18'S, 121°17'E, Aug 1977, *Barker* 2046 (AD); 16 km NE of Well 42, Canning Stock Route, May 1979, *George* 15570 (PERTH); c. 10 km SW of rockhole, Wilson Cliffs, Great Sandy Desert, 22°11'S, 127°03'E, May 1977, *de Graaf* 40 (PERTH). MUELLER DISTRICT: Wolf Creek Crater, 19°10'S, 127°48'E, Apr 1979, *George* 15332 (PERTH). KEARTLAND DISTRICT: Little Sandy Desert, 22°53'S, 121°59'E, Apr 1979, *Mitchell* 520 (PERTH). Northern Territory. VICTORIA RIVER REGION: Upper Victoria River, undated, *Mueller* s.n. (K). CENTRAL NORTHERN REGION: The Granites Tenements, Tanami Desert, 20°33'S, 130°18'E, Dec 1984, *Kalotas* 1699 (DNA); 20 miles [32.2 km] S The Granites, Aug 1936, *Cleland* s.n. (AD,DNA); 13 miles [20.9 km] NW Numagalong Homestead, Aug 1965, *Nelson* & *Swinbourne* 6 (AD,BRI,DNA,MEL,NSW). CENTRAL SOUTHERN REGION: 18 miles [29 km] W Ehrenberg Range, 23°13'S, 130°06'E, Apr 1972, *Latz* 2313 (AD,DNA,PERTH); Tobermorey Station, Yardida Bore, 23°18'S, 137°51'E, May 1972, *Dunlop* 2579 (BRI,DNA,NSW); Simpson Desert, 15 miles [24.1 km] N Andado Homestead, 25°10'S, 135°12'E,

Aug. 1968, *Wiedemann* A.47 (DNA); ditto, *Wiedemann* A.54 (DNA); Simpson Desert, Amerada Petroleum Corporation n° 1 Hale River, Nov 1966, *Symon* 4344 (AD,NSW).

Distribution and habitat: *O. pterospora* occurs in central Australia from the Great Sandy Desert, Western Australia to the Simpson Desert, Northern Territory (**Map 7**). It grows on red sandy soils on sand ridges and sandhills in spinifex grasslands, shrub steppes and open eucalypt woodlands; also recorded in a disturbed site on gravelly soils.

Conservation status: This species is not considered to be rare or threatened at present.

Notes: A very distinctive species with its flowers borne in pairs on unequal stout pedicels, its depressed obovoid capsule with a distinctly emarginate beak and its meniscoid seeds. This species has evident affinities with *O. mitrasacmoides* which has similar floral and seed morphology.

16. Oldenlandia largiflorens (Halford) Halford, **comb. nov.**

Hedyotis largiflorens Halford, *Austrobaileya* 3: 204 (1990) **Type:** Northern Territory. DARWIN AND GULF DISTRICT: Edith Falls, 33 km N of Katherine, 28 April 1989, *D. Halford* H75 (holo: BRI; iso: DNA,K,PERTH).

See Halford (1990) for a description, illustration and notes on distribution.

17. Oldenlandia laceyi (Halford) Halford, **comb. nov.**

Hedyotis laceyi Halford, *Austrobaileya* 3: 208 (1990) **Type:** Queensland. COOK DISTRICT: Mareeba mining lease, Tinaroo Creek road, c. 15 km SE of Mareeba, 9.6 km off Kennedy Highway, 1 km before Douglas Creek crossing, 1 May 1972, *I.B. Staples* 010572/11 (holo: BRI; iso: DNA,K,PERTH).

See Halford (1990) for a description, illustration and notes on distribution.

18. Oldenlandia leptocaulis (Halford) Halford, **comb. nov.**

Hedyotis leptocaulis Halford, *Austrobaileya* 3: 206 (1990) **Type:** Northern Territory. DARWIN AND GULF DISTRICT: 7.5 km S of Cooina on Pine Creek road, 20 May 1980, *M. Lazarides* 8869 (holo: DNA; iso: AD,BRI,CANB,MEL,NSW).

See Halford (1990) for a description, illustration and notes on distribution.

19. Oldenlandia thysanota (Halford) Halford, **comb. nov.**

Hedyotis thysanota Halford, *Austrobaileya* 3: 209 (1990) **Type:** Northern Territory. DARWIN AND GULF DISTRICT: near Koongarra saddle, 1.5 km north of Koongarra, 22 May 1980, *M. Lazarides* 8899 (holo: DNA; iso: AD,BRI,CANB,MEL,NSW).

See Halford (1990) for a description, illustration and notes on distribution.

20. Oldenlandia delicata (Halford) Halford, **comb. nov.**

Hedyotis delicata Halford, *Austrobaileya* 3: 211 (1990) **Type:** Western Australia. GARDNER DISTRICT: 28 km S of Kununurra, east bank of spillway creek next to bridge on road to Ord Dam, 20 April 1989, *D. Halford* H54 (holo: BRI; iso: DNA,K,PERTH).

See Halford (1990) for a description, illustration and notes on distribution.

Unknown and excluded taxa

Oldenlandia mollugoides O. Schwarz, *Repert. spec. nov. regni veg.* 24: 99 (1927). **Type:** 'Port Darwin, sect. 44 (*Bleeser* No. 259)'.
 The type was destroyed in Berlin in 1943 and no duplicates of this Bleeser number have been found. From Schwarz's description of this taxon it appears to be an early record of the pantropical species *Oldenlandia corymbosa*.

Hedyotis psychotrioides F. Muell., *The Victoria Naturalist* 6: 54 (1889) = *Wendlandia psychotrioides* (F. Muell.) F. Muell., *The Victoria Naturalist* 8: 178 (1892).

Oldenlandia paniculata L. Trimen (1894) noted that '*O. paniculata* is quite doubtful; it is entirely based on a figure in Burmans Thes. Zeyl. t. 71 f. 2, which is apparently a *Mollugo* (certainly not an *Oldenlandia*)'.

Synaptantha

Synaptantha J.D. Hook., in Benth. & J.D. Hook. Gen. pl. 2: 61 (1873). Type: *Hedyotis tillaeacea* F. Muell. (*S. tillaeacea* (F. Muell.) J.D. Hook.).

Small herbs with perennial or annual rootstock; stems procumbent or weakly ascending. Leaves opposite, sessile or shortly petiolate. Stipules interpetiolar, adnate to leaf bases forming sheath around the node, scarious, truncate or produced into triangular lobe, entire or lacinate on margin. Flowers 4-merous, isostylous or heterostylous, solitary or in groups of 2-5 at nodes. Calyx-tube subglobose; lobes distinct. Corolla marcescent on fruit in some species; tube very short, up to 0.2 mm long; lobes triangular to ovate, valvate. Stamens with filaments attached to base of corolla as well as to ovary; anthers dorsifixed. Ovary 2-locular, 1/2 to 3/4 inferior; ovules 10-50 on fleshy, globose placentas. Placenta peltately attached by a slender stalk to the middle or to the lower half of septum. Style filiform; stigma bifid; lobes globose or linear. Capsules crustaceous with loculicidally dehiscent beak. Seeds numerous, depressed obconic or depressed ovoid, not becoming mucilaginous when moistened; surface reddish brown, reticulate-areolate.

Distribution: A genus of 2 species; both are endemic to Australia, 1 species is widespread in inland regions.

Notes: *Synaptantha* may be distinguished from other genera of the *Hedyotis/Oldenlandia* complex by its scarcely perceptibly connate corolla lobes; by its staminal filaments being firmly attached to the ovary as well as to the corolla; and by its 1/2 to 3/4 inferior ovaries.

Key to the species of *Synaptantha*

1. Flowers solitary or in clusters of 2-5; subtending leaf not reduced to bract; pedicels 1-6 mm long; seeds depressed obconic. WA, NT, Qld, SA, NSW 1. *S. tillaeacea*
- Flowers solitary or paired; subtending leaf usually reduced to bract 3 mm long; pedicels c. 1 mm long; seeds depressed ovoid. WA, NT 2. *S. scleranthoides*
1. *Synaptantha tillaeacea* (F. Muell.) J.D. Hook., Icon. pl. 12: 41-42 t. 1146 (1876); *Hedyotis tillaeacea* F. Muell., Fragm. 4: 39 (1863); *Oldenlandia tillaeacea* (F. Muell.) F. Muell., Syst. cens. Austral. pl. 74: (1882). Type: [New South Wales.] Duroodoo [Dooroodoo] between the Darling and Barrier Range, 27 December 1861, Dr Beckler s.n. (lecto (here designated): MEL(MEL 61491)).

Compact procumbent or weakly ascending herbs to 10 cm high; usually much branched; branchlets terete or tetragonous or triquetrous, tuberculate, hispidulous or glabrous. Leaves mostly sessile or rarely shortly petiolate, linear-oblong, narrowly oblanceolate or very narrowly elliptic 3-17 mm long, 0.5-2.0 mm wide, glabrous, hispidulous or with scabrous hairs, attenuate or truncate at base, obtuse, acute or rounded at apex, with margin sometimes recurved. Stipule-sheath glabrous or hispidulous, 0.5-1.0 mm long, truncate or produced into yellow triangular gland, entire or lacerate to lacinate on margin. Flowers solitary or in groups of 2-5 at nodes. Pedicels 1-6 mm long, glabrous or hispidulous. Calyx-tube subglobose, 0.8-1.3 mm diameter; lobes linear to narrowly triangular, 0.5-1.5 mm long, glabrous, hispidulous or with a few scabrous hairs, sometimes with gland at sinus between lobes. Corolla pale yellow to greenish yellow or whitish with pale pink flush towards tips, marcescent; tube c. 0.1 mm; lobes triangular to ovate, 0.5-2.5 mm long, glabrous or hispidulous outside, hairy inside especially towards apex with short clavate hairs. Staminal filaments 0.3-1.4 mm long. Ovary 1/2 to 2/3 inferior; style filiform, 0.1-1.4 mm long; stigma bifid; lobes globose or filiform, finely puberulent with glandular hairs over surface. Capsule subglobose, ovoid or transverse ovoid, 1.2-2.0 mm long, 1.0-2.0 mm wide, glabrous; calyx lobes erect; beak 0.6-1.0 mm long, rounded.

Seeds depressed obconic, laterally compressed, 0.3–0.4 mm wide; surface light brown, reticulate-areolate.

Synaptantha tillaeacea exhibits considerable variability over its range. Two varieties are here recognised.

1. Plant glabrous with smooth or tuberculate stems, never hispidulous; gland present or absent in sinus between calyx lobes var. *tillaeacea*
Plant hispidulous; sinus between calyx lobes without gland var. *hispidula*

1a. *Synaptantha tillaeacea* (F. Muell.) J.D. Hook. var. *tillaeacea*

Hedyotis elatinoides Benth., Fl. Austral. 3: 405 (1866); *Oldenlandia elatinoides* (Benth.) F. Muell., Syst. cens. Austral. pl. 74 (1882). **Type:** [Western Australia.] Swan River, *Drummond* 4th coll. 108 (holo: K, n.v., photo BRI).

Plant glabrous, never hispidulous, with smooth or tuberculate stems; branchlets terete or ribbed. Gland present or absent in sinus between calyx lobes. Corolla lobes 0.5–2.5 mm long.

Selected specimens. **Western Australia.** ASHBURTON DISTRICT: c. 25 km W of Carnegie H.S. on road to Wiluna, Sep 1984, *Wilson* 11995 (PERTH). CARNEGIE DISTRICT: Beru Pool, Yelma Station, Sep 1973, *Chinnock* 751 (AD). COOLGARDIE DISTRICT: Afghan Rock, c. 180 km E of Norseman, Sep 1980, *Newbey* 7434 (PERTH). FORTESCUE DISTRICT: upper waters of the Fortescue River, May 1958, *Burbidge* 6046 (AD,CANB,PERTH). GILES DISTRICT: along domestic drain at Giles, Rawlinson Range, Aug 1962, *Symon* 2512 (AD). **Northern Territory.** CENTRAL NORTHERN REGION: 5.8 miles [9.3 km] N of Georgina Downs, Oct 1957, *Chippendale & Johnson* 3803 (AD,BRI,DNA,MEL,NSW,PERTH); No. 3 Bore, Manners Creek Station, May 1972, *Latz* 2529 (DNA,NSW); Cockroach Waterhole, Manners Creek Station, May 1972, *Latz* 2522 (BRI,DNA,NSW). CENTRAL SOUTHERN REGION: Hull Creek, Aug 1973, *Latz* 4506 (AD,DNA); Andado Station, Apr 1977, *Henshall* 1426 (AD,DNA); Ayers Rock National Park, Aug 1972, *Dunlop* 2973 (DNA,NSW). **Queensland.** NORTH KENNEDY DISTRICT: 97 km N of Charters Towers, May 1989, *Halford* Q129 (BRI,CANB,K,PERTH). DARLING DOWNS DISTRICT: 'Woodlands', 5 miles [8 km] SW of Westmar, Mar 1961, *Pedley* 753 (BRI). **South Australia.** NORTH-WESTERN REGION: 30 km W of Mimili, Everard Ranges, May 1983, *Bates* 2982 (AD); near Mt Carmena, Western Everard Ranges, Sep 1968, *Kraehenbuehl* 3960 (AD). LAKE EYRE REGION: c. 32 km NE of Innamincka, just west of the S.A./Qld border, Aug 1968, *Kuchel* 2546 (AD,MEL). EASTERN REGION: c. 10 km W of Quinyambie Homestead, Jul 1971, *Whibley* 3499 (AD). **New South Wales.** NORTH FAR WESTERN PLAINS: Fowlers Gap near Broken Hill, Oct 1975, *Jacobs* 2115 (AD,NSW). NORTH WESTERN PLAINS: 'Tuudulya' c. 40 km SE of Louth, Mar 1976, *Moore* 7373 (CANB).

Distribution and habitat: This variety occurs widely across arid Australia, in all mainland states except Victoria, between latitudes 19°S and 34°S (**Map 12**). It grows in a range of soils but most often found in sandy or loamy soils; in the east it is associated with sclerophyllous forest and open woodlands; in the rest of its range it is associated with spinifex grasslands and *Acacia* shrublands, frequently near rocky outcrops, waterholes, claypans and on banks of creeks.

Typification and notes: Mueller cited four collections with his description of *Hedyotis tillaeacea*: (1) (MEL 61492) Cooper's Creek, undated, *Dr Murray* s.n. (2) (MEL 61490) This sheet has two labels 'Flooded ground south of Wills Creek' and 'depressed ground' both *Dr Murray*, Howitt expedition (3) (MEL 61493) Mackenzie, undated, *Mueller* (4) (MEL 61491) Duroodoo [Dooroodoo] between the Darling and Barrier Range, 27 Dec 1861, *Dr Beckler* s.n.. All the specimens cited by Mueller appear to have been used in the production of the description. However the first two specimens above have a gland in the sinus between the calyx lobes. Mueller does not mention the presence of this gland in his description. MEL 61491 is here designated as lectotype as it has flowers and fruits and it best fits the original description.

This variety is far from homogenous with at least three forms recognizable. They are not formally recognized here because of the presence of intermediate forms. Field and biosystematic investigations are required to understand the variability of this taxon.

Form 1. Prostrate herbs with annual or perennial rootstock; branchlets ribbed, glabrous or sparsely covered with scabrous hairs. Leaves linear, oblanceolate or elliptic, mostly 6–17 mm long. Stipule-sheath lacinate on margin, gland absent. Sinus between calyx lobes without gland, although small colleters may be present. Corolla lobes 0.5–1.5 mm long. Capsule subglobose to depressed ovoid. This is the most common and widespread form.

Form 2. Compact tufted herbs with a perennial woody rootstock; branchlets ribbed, tuberculate, glabrous. Leaves linear, 5–7 mm long. Large yellow gland in sinus between calyx lobes and on stipule-sheath. Corolla lobes 1.5–2.5 mm long. Capsule subglobose to ovoid. This form is well developed in north east Queensland e.g. *Forster* PIF3645 & *Bolton*, *Halford* H134, *Henderson* H2651. This form intergrades with Form 1 over a wide area in southern Queensland and northern New South Wales.

Form 3. Small prostrate annual herbs; branchlets ribbed or terete, glabrous. Leaves narrow oblanceolate or elliptic, 2–5 mm long. Stipule-sheath entire or lacinate on margin, gland absent. Sinus between calyx lobes without gland. Corolla lobes 0.5–1.0 mm long. Capsule subglobose to ovoid. Plants from central eastern Western Australia and south west Northern Territory are of this form e.g. *George* 5435, *Tolken* 6064 and *Dunlop* 2973.

1b. *Synaptantha tillaeacea* var. *hispidula* Halford, var. nov. planta hispidula; ramuli rotundati; glandula in sinu inter corollae lobos non praesens; corollae lobi 1–1.5 mm longi. **Typus:** Napperby Salt Lake, 22°51'S, 132°33'E, 12 January 1972, *Dunlop* 2355 (holo: BRI; iso: AD,DNA,NSW).

Plant hispidulous. Branchlets terete. Sinus between calyx lobes without gland. Corolla lobes 1.0–1.5 mm long.

Selected specimens: Northern Territory. CENTRAL NORTHERN REGION: between Inningarra Range and Mongrel Downs Homestead, 20°42'S, 129°44'E, Aug 1970, *Parker* 302 (DNA,MEL); 24 miles [38.6 km] SSE of The Granites, 20°45'S, 130°30'E, Jul 1970, *Parker* 244 (DNA,NSW); Lake Bennett, 22°47'S, 131°01'E, Jan 1972, *Latz* 2665 (DNA). CENTRAL SOUTHERN REGION: bed of Hay River, c. 14 km SSE of Mt Winnecke, 23°18'S, 137°01'E, Jul 1982, *Purdie* 2344 (CANB); c. 3 miles [4.8 km] SW [of] Kings Canyon, 24°16'S, 131°39'E, Dec 1968, *Latz* 329 (AD,DNA); NW Simpson Desert, 24°15'S, 136°35'E, Sep 1973, *Latz* 4634 (DNA); c. 3 km SSW of Kulgera, 25°52'S, 133°17'E, Apr 1978, *Barker* 3522 (AD); 20 km S of McDills number one bore, Simpson Desert, 25°54'S, 135°49'E, Sep 1987, *Leach* 1515 (BRI). South Australia. LAKE EYRE REGION: riverbed of Hamilton River at Pedirka, Jul 1968, *Lothian* 4735 (AD); 2 miles (c. 3 km) E of base camp, which is c. 61 km E of Dalhousie Springs, Aug 1963, *Lothian* 1852 (AD); Goyders Lagoon, 26°46'S, 139°31'E, Aug 1975, *Weber* 4486 (AD); Ross's waterhole, Macumba River, Jan 1927, *Cleland* [AD97148232] (AD); Conngie Lakes, Lake Marroocutchanie, 27°10'S, 140°13'E, Feb 1987, *O'Malley* 335 (AD); Margaret Overflow, 2 km W of the Curdimurka Siding, Oct 1978, *Alcock* 6528 (AD); Muloorina, 29°14'S, 137°54'E, Jul 1973, *S.A. Pastoral Board* [AD98010359] (AD). FLINDERS RANGE REGION: Lake Torrens Basin, east Yadlakina Soakage, Aug 1883, *Cleland* [AD97304236] (AD). EASTERN REGION: 30.91 km from Balcanooona homestead at 107°06', 30°36'54"S, 139°36'39"E, Aug 1980, *Williams* 11395 (AD); 17 km E of Frome Downs Homestead, 31°14'S, 139°58'E, Apr 1976, *Williams* 7924 (AD). Queensland. GREGORY SOUTH DISTRICT: QNC Trip, Site 5, stony downs, c. 30 km ENE of 'Rosebirth', 25°44'S, 139°56'E, Aug 1978, *Purdie* 1284 (BRI).

Distribution and habitat: This variety occurs in central Australia from the Tanami Desert, Northern Territory, south-east to south-western Queensland, western New South Wales and to the Flinders Ranges, South Australia (**Map 11**). It grows in sandy or clay soils in association with spinifex grasslands, herblands or shrublands, frequently in interdunal hollows, near claypans, waterholes and near ephemeral creeks.

2. *Synaptantha scleranthoides* (F. Muell.) Pedley ex Halford, **comb. nov.**

Hedyotis scleranthoides F. Muell., *Fragm.* 4: 39 (1863); *Oldenlandia scleranthoides* (F. Muell.) F. Muell., *Syst. cens. Austral. pl.* 74 (1883); *Anotis scleranthoides* (F. Muell.) Domin, *Biblioth. Bot.* 89: 616 (1929). **Type:** [Northern Territory,] Depot Creek, 30 May 1856, *Mueller* (holo: MEL(MEL 61489)).

Prostrate to decumbent annual herbs, regularly dichotomously branched; branchlets terete or ribbed especially when young, glabrous, rarely scabrous on ribs, occasionally red. Leaves sessile, linear to somewhat subterete, 3–15 mm long, up to 1 mm wide, glabrous, mucronate at apex, sessile. Stipule-sheath truncate, c. 0.5 mm long, with 2 or 3 laciniae on margin. Flowers solitary or paired at node, subtending leaf reduced to bract, serrulate on margin; pedicel c. 1 mm long. Calyx-tube subglobose, c. 1 mm diameter, glabrous; lobes narrowly triangular, 1–1.5 mm long, mucronate, collectors sometimes present between lobes. Corolla white, rotate; tube short, 0.1–0.2 mm long; lobes ovate, 1–1.5 mm long, acute to acuminate at apex, with scattered glandular hairs on margin. Stamens exserted; filaments 0.5–0.8 mm long, attached to base of corolla and ovary; anthers oval c. 0.5 mm long. Style 0.5–0.8 mm long; stigma bifid; lobes globular. Capsule globular, 1–1.8 mm diameter, not furrowed along dissepiment; calyx lobes spreading; beak rounded,

0.5–0.7 mm long, not protruding above calyx lobes. Seeds subglobose, 0.3–0.7 mm wide; surface brown, reticulate-areolate.

Selected specimens: Western Australia. GARDNER DISTRICT: Cape Anjo, N coast of W.A., 13°56'S, 126°34'E, Jul 1973, *Wilson* 11307 (PERTH); Mitchell River, 14°50'S, 125°42'E, Feb 1980, *Dunlop* 5277 (BRI,DNA,PERTH); 16 km along Surveyors Fall track, N of Mitchell Plateau Mining Camp, ± 14°40'S, 125°47'E, Apr 1977, *George* 14487 (PERTH); Mitchell Plateau, 14°50'S, 125°50'E, Jun 1976, *Kennedally* 4884 (PERTH); c. 27 km N of Kalumburu Mission, 14°07'S, 126°45'E, May 1983, *Fryxell & Craven* 4108 (BRI,MEL); Byan Martin Homestead, Bonaparte Archipelago, 15°24'S, 124°22'E, Jul 1973, *Wilson* 11507 (PERTH); Augustus Island, Bonaparte Archipelago, 15°25'S, 124°35'E, May 1972, *Wilson* 10724 (PERTH); Blyxa Creek, Prince Regent River Reserve, 15°42'S, 125°20'E, Aug 1974, *George* 12576 (PERTH); 40 miles [64 km] N Drysdale River, May 1971, *Byrnes* 2282 (BRI,DNA,NSW,PERTH); King Edward River, old CRA campsite, 1 km S of track to old Mitchell River Station (abandoned), 15°08'S, 126°09'E, Jun 1988, *Edinger* 587 (BRI,PERTH); 28 km S of Kununurra, E bank of spillway creek next to bridge on road to Ord Dam, 16°01'S, 128°47'E, Apr 1989, *Halford* H15 (BRI); quartzitic sandstone hills S of the Ernest River, 15°23'S, 127°27'E, Mar 1978, *Hartley* 14698 (CANB); 95 km W along Gibb River Road, from Great Northern Highway, 15°50'S, 127°25'E, Apr 1989, *Halford* H29 (BRI). FITZGERALD DISTRICT: Bindoola Creek, 8.5 km WSW of Home Valley Homestead, Mar 1978, *Lazarides* 8622 (BRI,CANB,DNA,NSW,PERTH); Isdell River near Grace Knob, May 1905, *Fitzgerald* 947 (PERTH); Yates Creek, Leopold Range, 17°09'S, 124°58'E, Apr 1988, *Cranfield* 6379 (PERTH); Inglis' Gap, King Leopold Ranges, May 1905, *Fitzgerald* 756 (PERTH). DAMPIER DISTRICT: Bobby Creek, 11 km ENE of Beagle Bay, Dampier Peninsula, 16°58'S, 122°47'E, Apr 1988, *Crater* 237 (PERTH); *Ibid.*, *Carter* 247 (PERTH); Meda-Oobagooma Road, 80 km by road N of Gibb River Road, 70 km NE of Derby, Jun 1976, *Beaglehole* ACB52743 (PERTH).

Distribution and habitat: Mueller's collection of *S. scleranthoides* from Depot Creek in the Victoria River Region is the only record of this species from the Northern Territory. All other collections come from the Kimberley Region, Western Australia, from the Dampier Peninsula east to the Ord River (**Map 12**). It grows mainly on creek banks or in shallow depressions in grasslands, forblands and open eucalypt or *Melaleuca* woodlands on sandy or sandy lateritic soils.

Conservation status: This species is not considered to be rare or threatened at present.

Notes: *S. scleranthoides* closely resembles *S. tillaeacea* in habit, flower and capsule morphology. Although the corolla and stamens are not persistent on the capsule as in *S. tillaeacea*, I believe it is appropriate to place this species in *Synaptantha* as it agrees in all other respects with the generic circumscription.

Hedyotis

Hedyotis L., Sp. pl. 1: 101 (1753), Gen. pl. ed. 5, 44 (1754). **Type:** *Hedyotis fruticosa* L. (lecto, *vide* Bremekamp, C.E.B., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 48(2): 29 (1952); *Hedyotis* L. sensu Benth., Fl. Austral. 3: 403–406 (1866), in part.; *Exallage* Bremekamp, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 48(2): 140 (1952); **Type:** *Hedyotis auricularia* L. (= *E. auricularia* (L.) Bremekamp).

Woody herbaceous perennials or subshrubs with stems erect or procumbent. Leaves opposite, entire, chartaceous or coriaceous, sessile or petiolate. Stipules interpetiolar, adnate to leaf-bases, coriaceous or chartaceous; margin with 1–several setae. Inflorescences axillary or terminal, subsessile fascicles or pedunculate corymbiform cymes. Flowers small, 4-merous, isostylous (or heterostylous not in Australia). Calyx-tube subglobose; lobes distinct, joined at base into a short free tube. Corolla white; tube short, not exceeding calyx lobes in length; lobes valvate. Stamens exserted; filaments attached to corolla at the sinus between lobes; anthers dorsifixed. Ovary 2-locular, inferior; ovules 5–15 on fleshy hemispherical placentas. Placenta peltately attached centrally to the septum by short stalk. Style exserted, terete; stigma bifid. Fruit hard, splitting septicidally to the base into two indehiscent pyrenes or rarely indehiscent; beak mostly absent. Seeds numerous, small, depressed obconic or angular, not becoming mucilaginous when moistened; surface reticulate-areolate.

Hedyotis occurs predominantly in tropical and subtropical regions of India, south east Asia, Malesia, Australia, Micronesia, Polynesia and North America. In Australia four native species occur in north east Queensland with one extending into the Northern Territory.

Bremekamp (1952) defined *Exallage* to include those species previously placed in *Hedyotis* with clustered axillary flowers and small indehiscent fruits of two pyrenes. I had initially considered this genus worthy of recognition but as pointed out by Fosberg and Sachet (1991) there are a number of Asia species that closely resemble *H. auricularia* except that there fruits are dehiscent, for example *H. novoguineensis*. Other species such as *H. vestita* and *H. radicans* have indehiscent fruits similar to *H. auricularia* but have pedunculate axillary inflorescences. I agree with Fosberg and Sachet (1991) that until such time there is a more critical examination of these closely allied taxa that *Exallage* should not be segregated from *Hedyotis*.

Key to Australia species of *Hedyotis*

1. Fruit splitting into two indehiscent cocci; stems tetragonous, 1–2 mm thick; leaves up to 3.5 cm long **4. *H. novoguineensis***
 Capsule indehiscent; stems rounded, 1.5–3.0 mm thick or if stems obtusely quadrangular, 2–4 mm thick; leaves longer than 4 cm 2
2. Capsule ellipsoid, 3.5–4 mm long, somewhat fleshy; leaves fleshy; capitate colleters present on margin of stipule-sheath; stems obtusely quadrangular **3. *H. philippensis***
 Fruit globose, 1.5–2 mm diameter, not fleshy; leaves chartaceous fleshy; 1–several setae up to 7 mm long on margin of stipule-sheath, stems terete 3
3. Leaf base obtuse to truncate; leaves smooth, shiny above; inflorescences shortly pedunculate; 1–3 glabrous setae on margin of stipule-sheath **2. *H. radicans***
 Leaf base attenuate; leaves scabridulous at least along margin, dull above; inflorescences sessile dense flowered cymes; 3–9 scabrous setae on margin of stipule-sheath **1. *H. auricularia* var. *melanesica***
- 1. *Hedyotis auricularia* L. var. *melanesica* Fosberg, Bull. Torrey Bot. Club 67: 419 (1940).**
Type: Fiji. Kandavu, hills above Namalata and Ngaloa Bays, *A.C. Smith* 157 (holo: NY, *n.v.*; iso: US, *n.v.*).
Hedyotis auricularia sensu Benth., Fl. Austral. 3: 404 (1866), non *Hedyotis auricularia* L.
Hedyotis lapeyrousii Bartling ex DC., Prodr. 4:420 (1830). **Type:** Vanikoro (holo: G-DC *n.v.*, microfiche BRI).
 [*Oldenlandia auricularia* (L.) F. Muell., Syst. cens. Austral. pl. 74 (1882) nom. inval.]

Decumbent or ascending herbaceous perennial to 40 cm high, much branched. Stems terete up to 2.5 mm diameter, glabrous or moderately covered with minute scabrous hairs, rooting at nodes. Leaves narrowly elliptic to lanceolate, 4–12 cm long, 5–24 mm wide, glabrous, hispidulous or with minute scabrous hairs along midrib above and along midrib and lateral veins below, attenuate at base, attenuate at apex; midrib and secondary nerves distinct on lower surface; petiole 4–8 mm long. Stipule-sheath 2–4.5 mm long, hispidulous, with 3–9 unequal setae up to 7 mm long; setae scabridulous. Inflorescences axillary, subsessile fascicles, 5–8-flowered; pedicels 1–1.5 mm long. Calyx-tube subglobose, c. 1 mm diameter, hispidulous; lobes linear to narrowly triangular, 1.5–2.5 mm long, hispidulous outside, recurved at apex, scabridulous on margin, colleters sometimes present between lobes. Corolla white, rarely tinged blue, sparsely hispidulous outside; tube 1.5–2.5 mm long; lobes linear, 1–2 mm long, erect, reflexed at apex, short stiff hairs inside at base. Staminal filaments thick, c. 0.5 mm long, short stiff hairs at base; anthers linear, c. 0.6 mm long. Style 2.0–3.5 mm long, stiff antrorse hairs on upper half; stigma bifid; lobes 0.5–1.0 mm long, spreading. Fruit indehiscent, cartilaginous, globose, 1.5–2 mm diameter, sparsely hispidulous; calyx lobes erect; beak absent. Seeds depressed obconic, angular, 0.4 mm long; surface dark brown, glossy, reticulate-areolate. **Fig. 7 F–H.**

Selected specimens: Indonesia. Irian Jaya: Mt Nerimbau, near Minjambau, Arfak Mountains, May 1962, *Koster* BW13875 (BRI). Papua New Guinea. WEST SEPIK PROVINCE: Near Kilifas Village, Mar 1970, *Foreman & Kumul* NGF48215 (BRI). NEW IRELAND PROVINCE: Lossuk Timber Reserve area, 40 km SE of Kavieng, Nov 1984, *Gideon* LAE57260 (BRI). WESTERN PROVINCE: Near Ingambit Village, Jun 1967, *Henty et al.* NGF33013 (BRI); Lake Daviumbu, Middle Fly River, Sep 1936, *Brass* 7772 (BRI); Daru Island, Apr 1936, *Brass* 6435 (BRI). NEW BRITAIN PROVINCE: Near helicopter pad on lower slopes of Mt Lululua, May 1973, *Stevens & Lelean* LAE58206 (BRI). BOUGAINVILLE PROVINCE: Near Aku village, c. 10 miles [16 km] W of Buin, Sep 1964, *Craven & Schodde* 449 (BRI). Northern Territory. DARWIN AND GULF REGION: Melville Isle; Mindelu Creek, 11°41'S, 13°38'E, Dec 1991, *Fensham* 1160 (DNA). Queensland. COOK DISTRICT: Lockerbie Scrub, 9.2 km past Lockerbie Homestead on Cape York road, 10°45'S, 142°31'E, Feb 1990, *Forster* PIF6338 (BRI,DNA,QRS,MEL,L); Maloney's Springs, 12°27'S, 142°56'E, Jun 1989, *Forster* PIF5306 (BRI), Brown's Creek, Pascoe River, Jul 1948, *Brass* 19607 (BRI,CANB); Chester River campsite, 13°41'S, 143°27'E, Jul 1978, *Clarkson* 2423 (BRI,NSW,QRS); Upper Parrot Creek, Annan River, Sep 1948, *Brass* 20309 (BRI, CANB); 2 km E of Daintree on road to Mossman, 16°16'S, 145°20'E, Sep 1990, *Halford* Q330 (BRI); Bellenden Ker, May 1937, *Flecker* 310 (AD); Ella Bay, 7 km NE of Innisfail, 17°29'S, 146°04'E, Aug 1990, *Halford* Q318 (BRI); Tully, Mar 1935, *Flecker* 379 (QRS). NORTH KENNEDY DISTRICT: Scraggy Point, Hinchinbrook Island, 18°17'S, 146°06'E, Mar 1975, *Thorsborne* 45 (BRI). PORT CURTIS DISTRICT: Byfield, near Keppel Bay, Sep 1931, *White* 8168 (BRI).

Distribution and habitat: *H. auricularia* var. *melanesica* is found throughout Malasia and Melanesia. In Australia this species occurs on Melville Island, Northern Territory and along the eastern Queensland coastline from Bamaga, Cape York Peninsula as far south as Byfield near Rockhampton (Map 15). It grows mainly on creek margins in sclerophyll forests and rainforests in areas with good light penetration to the forest floor or in swampy areas in *Melaleuca* woodlands. Soils are variable.

Conservation status: This species is not considered rare or endangered at present.

Notes: Williams (1987) in his book 'Native Plants of Queensland' Volume 3 page 158 has a photograph labeled as *Hedyotis lapeyrousii*. This is a misidentification and the plant pictured is actually *Hedyotis philippensis*.

2. *Hedyotis radicans* (Bartling ex DC.) Miq., Fl. Ind. Bat. 2: 181 (1859); *Metabolos radicans* Bartling ex DC., Prodr. 4: 435 (1830); *Oldenlandia radicans* (Bartling ex DC.) Kuntze, Rev. Gen. 1: 292 (1891); *Exallage radicans* (Bartl. ex DC.) Bremek., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 48(2): 142 (1952).
Type: [Philippines.] Luzon, Haenke (holo: PR; iso: G-DC, *n.v.*, microfiche BRI).

Decumbent herbaceous perennial. Stems terete, 1.5–3 mm diameter, glabrous or with soft hairs extending in a single or in two opposite lines down the stem, rooting at nodes. Leaves narrow elliptic to lanceolate, 6.5–15 cm long, 1–3 cm wide, glabrous, obtuse or truncate at base, acuminate at apex, midrib canaliculate above, midrib and secondary nerves distinct on lower surface; petiole 2–7 mm long, glabrous. Stipule-sheath coriaceous, 3–5 mm long, glabrous or pilose, with 1–3 setae, 3–15 mm long, colleters on margin. Inflorescences axillary, pedunculate corymbiform cymes, 5–8-flowered, 1–3 peduncles per node; peduncles 5–10 mm long, hispidulous; pedicels 1–2 mm long; bracts subulate up to 2 mm long. Calyx-tube subglobose, c. 1 mm diameter, glabrous; lobes triangular, 1.0–1.5 mm long, glabrous, reflexed at apex. Corolla white rarely with green tinge, glabrous outside; tube 1–1.5 mm long; lobes linear 1.5–2 mm long, erect, short stiff hairs inside at base, reflexed at apex. Staminal filaments thick, c. 0.5 mm long, stiff hairs at base; anthers linear-oblong c. 0.7 mm long. Style 2–2.5 mm long, stiff antrorse hairs on middle half; stigma bifid; lobes linear, 0.3–0.6 mm long, reflexed. Capsule indehiscent, cartilaginous, globose, 1.5–2.5 mm diameter, glabrous; calyx lobes erect, recurved at apex; beak absent. Seeds obconic, laterally compressed, c. 0.5 mm long; surface dark brown, reticulate-areolate. **Fig. 7A–E.**

Selected specimens: Philippines. Luzon, Nov-Dec 1918, *Ramos & Edano* BS33798 (BRI); Lake Polog, Luzon, Aug 1915, *Ramos* BS23647 (L); Capiz Province, Panay, Oct and Nov 1925, *Edano* BS46025 (BRI); Alabat Island, Dec 1916, *Merrill* 10465 (L); Cabadbaran (Mt Urdaneta), Mindanao, Oct 1912, *Elmer* 14122 (L). Papua New Guinea. WESTERN PROVINCE: Tarara, Wassi Kussa River, Dec 1936, *Brass* 8503 (BRI, L); Strickland River, 1885, *Bauerlen* [AQ461313] (BRI). CENTRAL PROVINCE: Dieni, Ononga Road, May 1933, *Brass* 3974 (BRI). NEW BRITAIN PROVINCE: Mount Penck, Eleonora Bay, 5°32'S, 149°39'E, May 1973, *Croft & Vinas* NGF41358 (BRI,L). Queensland. COOK DISTRICT: Lamond Hill, Iron Range, Jul 1991, *Forster* PIF9012 (BRI,DNA,K,L,MEL,QRS); Lockhart River, 12°48'S, 143°18'E, date unknown, *Tucker* 366 (QRS); Oliver Creek at tributary of Noah Creek, Cape Tribulation, 16°06'S, 145°27'E, Oct 1973, *Webb & Tracey* 10828 (BRI); South Johnstone, Mar 1938, *Langdon* [AQ445772] (BRI); 6 km W of Babinda, 17°20'S, 145°52'E, Sep 1990, *Halford* Q343 (BRI); Wyvuri Holding, 17°20'S, 146°00'E, Apr 1972, *Hyland* 6024 (QRS); Ella Bay, 7 km NE of Innisfail, 17°29'E, 146°04'E, Aug 1990, *Halford* Q320 (BRI); 5.5 km due W of Clump Point, Lacey Creek State Forest Park, 17°51'S, 146°04'E, Sep 1990, *Halford* Q348 (BRI); State Forest 702, south bank of Murray River near mouth, 18°05'S, 146°01'E, Oct 1975, *Thorsborne* 115 (BRI).

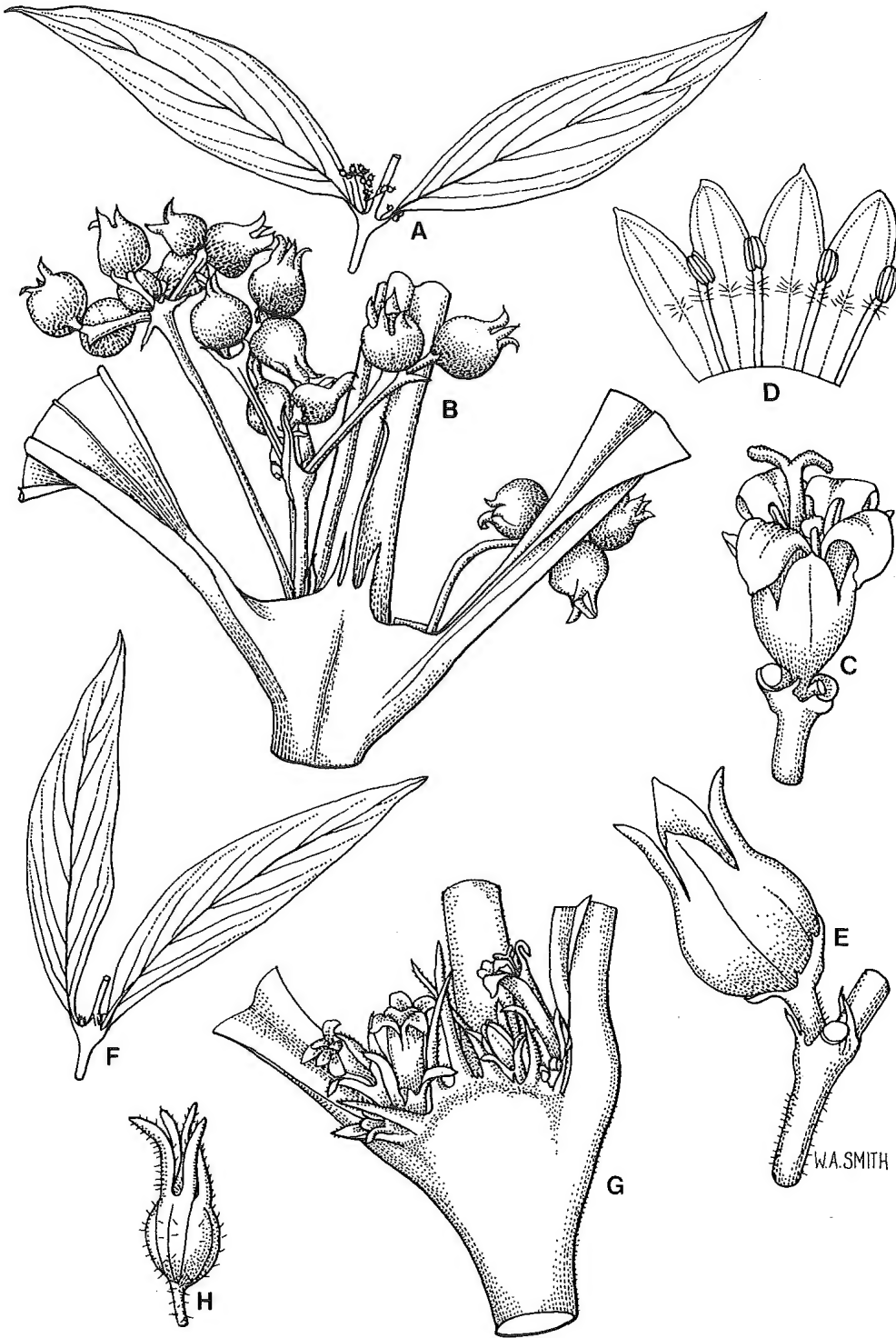


Fig. 7. *Hedyotis radicans*: A. leaves and inflorescence $\times 0.5$. B. inflorescence $\times 4$. C. flower $\times 8$. D. corolla opened out $\times 8$. E. side view of fruit $\times 8$. *Hedyotis auricularia* var. *melanesica*: F. leaves and inflorescence $\times 0.5$. G. inflorescence $\times 4$. H. side view of fruit $\times 8$. A-E, Halford Q320; F,G, Halford Q347; H, Halford Q324.

Distribution and habitat: *H. radicans* occurs in the Philippines and New Guinea. In Australia it is known from along the eastern Queensland coastline from Iron Range to the Murray River near Tully (**Map 14**). It has been recorded in rainforests on the edge of logging tracks, near streams and in areas where strong sunlight reaches the forest floor. Soils are variable.

Conservation status: This species is not considered rare or threatened at the present time.

Notes: The Australian and Papuan New Guinea material that I have seen have leaves much longer than the type material from the Philippines (c. twice as long). The Australian and Papua New Guinea material also differs from the Philippines material in having longer peduncles and being generally less hairy on stems and leaves. *H. radicans* is closely related to *H. auricularia* var. *melanesica* with which it has been previously confused having a similar flower structure and habit. *H. radicans* can be distinguished by its axillary corymbose inflorescences on short peduncles, its obtuse or truncate leaf bases and its glabrous setae on the margin of the stipule-sheath.

I have observed on three occasions parapatric populations of *H. radicans* and *H. auricularia* var. *melanesica*. Examination of these populations reveal no individuals intermediate morphologically and all plants were unequivocally distinguishable as *H. radicans* or *H. auricularia* var. *melanesica*.

3. *Hedyotis philippensis* (Willd. ex Sprengel) Merr. ex C. Robinson, Philipp. J. Sci. 6: 222 (1911); *Spermacoce philippensis* Willd. ex Sprengel, Syst. Veg. 1: 401 (1824); *Exallage philippensis* (Willd. ex Sprengel) Bremek., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. II. 48(2): 142 (1952). **Type:** [Philippines.] *Humbolt* (holo: B-Willd 2611, n.v., microfiche BRI).

Hedyotis congesta R. Br. ex G. Don, Gen. Syst. 3: 526 (1834); *Exallage congesta* (R. Br. ex G. Don) Bremek., Verh. Kon. Ned. Akad. Wetensch. Afd. Natuurk., Tweede Sect. II. 48(2): 142 (1952). **Type:** Penang, Aug 1822, *Wallich* Cat. No. 844 (holo: K-W, n.v., microfiche BRI).

Illustration: Williams, Nat. pl. Queensl. 3: 158 (1987), misidentified as *Hedyotis lapeyrousii*.

Erect perennial subshrub to 1 m high, openly branched. Stems stout, 2–4 mm thick, obtusely quadrangular, glabrous. Leaves narrow-lanceolate to ovate-lanceolate or narrow elliptic, 4–11 cm long, 1–3 cm wide, glabrous, somewhat fleshy, shiny above, shortly attenuate to obtuse at base, acute to acuminate at apex; midrib canaliculate above, prominent below; petiole 3–10 mm long, glabrous. Stipule-sheath 2–4 mm long, produced into triangular lobe to 7 mm long, villose; margin fimbriate with colleters distinctly capitate. Flowers isostylous (or heterostylous not in Australia). Inflorescences axillary, subsessile fascicles, many-flowered. Calyx-tube globose to obconical, 1.0–2.0 mm diameter, glabrous; lobes elliptic or triangular, 2.5–3.0 mm long, glandular appendage at sinus between lobes. Corolla white, cream or pale mauve; tube cylindrical, 2–3 mm long, glabrous; lobes 2.0–2.5 mm long, erect, reflexed at apex. Staminal filaments c. 1 mm long; anthers oblong, 1.0–1.5 mm long. Style 2.5–3.5 mm long; stigma bifid; lobes linear-oblong, 1.0–1.5 mm long. Fruit ellipsoid, somewhat fleshy, 3.5–4.0 mm long, 2.0–2.5 mm wide, glabrous; calyx lobes erect; beak conical, c. 1 mm long, indehiscent or tardily dehiscent septically into two pyrenes. Seeds depressed obconic, c. 0.5 mm wide; surface dark brown, reticulate-areolate.

Selected specimens: **Thailand.** Province Trang, Kao Chong area, Jun 1974, *Geesink et al.* 7238 (L). **Malaysia.** Malaya Peninsula: Sungai Buloh, Ulu Selangor, Jan 1966, *Hardial & Sidek* 403 (BRI); Alor Bukit, Johore, Nov 1966, *Hardial* 559 (BRI); Sabah. Tawao, Elphinstone Province, Oct 1922 to Mar 1923, *Elmer* 20632 (BRI). **Indonesia.** Sumatera Utara: Sikundar Nature Conservations, Interior of Besting, NW of Tandjunpura, Aug 1971, *Iwatsuki et al.* S299 (L); Kalimantan Timur: around Jelini, along Sungai Belayan, NW of Tabang, Jan 1979, *Murata et al.* B1227 (L). **Philippines.** Luzon Island. Province of Tayabas, Mar 1917, *Edano* BS26953 (L); Panay Island. Libacao, Capiz Province, May-Jun 1919, *Martelino & Edano* BS35384 (BRI); Jaminan, Capiz province, Apr-May 1918, *Ramos & Edano* BS30880 (L). **Papua New Guinea.** WESTERN PROVINCE: Near Ingambit Village, Jun 1967, *Henty et al.* NGF31898 (BRI); Near Rouku, Jul 1974, *Henty* NGF49708 (BRI); Aruh, Wassi Kussa River, Jul 1968, *Henty & Katik* NGF38662 (BRI). **Queensland.** COOK DISTRICT: c. 45 miles [72.4 km] S of Cape York, Jun 1968, *Pedley* 2733 (BRI); Jardine River, 1 km N of McHenry River junction, 11°17'S, 142°34'E, Oct 1979, *Irvine* 1963 (QRS); Elliot River at the junction of the Elliot River and Mistake Creek, 11°20'S, 142°24'E, Aug 1987, *Clarkson* 7338 (BRI, QRS); Heathlands National Park, Captain Billy Landing Road, 5 km from C.B.

Landing, Sep 1985, *Williams* 85221 (BRI); Tozer Gap, Tozer Range, [12°43'S, 143°11'E], Jul 1948, *Brass* 19517 (BRI,CANB); Iron Range road, 2.6 km past Garraway Creek crossing, Cape Weymouth, Apr 1988, *Forster* PIF4186 & *Liddle* (BRI).

Distribution and habitat: *H. philippensis* is widely distributed in Thailand, Indonesia, Philippines and New Guinea. In Australia this species is found on Cape York Peninsula in an area extending from the Elliot River to Iron Range (**Map 13**). It grows on stream banks in sandy soils in open forests, and seasonally boggy areas in *Melaleuca* swamps, *Casuarina-Melaleuca* scrubs and open forest.

Conservation status: *Hedyotis philippensis* has a limited range in Australia. It is known to occur in the Heathlands National Park. A conservation coding of 3RC+ is appropriate.

Notes: From the overseas material that I have examined this species is very variable in its leaf size over its range.

4. *Hedyotis novoguineensis* Merr. & Perry, J. Arnold Arbor. 26: 4 (1945). **Type:** Papua New Guinea. WESTERN PROVINCE: Wuroi, Oriomao River, Jan-Mar 1934, *L.J. Brass* 5831 (iso: BRI).

Ascending to erect or decumbent herbaceous perennial(?) to 50 cm tall. Stems tetragonous, sparsely to densely pubescent, becoming glabrous. Leaves elliptic to obovate, 2–3 cm long, 7–15 mm wide, glabrous above except for sparse pubescence on midrib, sparsely pubescent below, midvein prominent on lower surface, acute or cuneate at base, acute at apex; petiole 1–2 mm long, pubescent. Stipule-sheath c. 1.5 mm long, glabrous or sparsely pubescent, produced into triangular lobe, sometimes deeply bifid. Inflorescences axillary, subsessile fascicles, many-flowered. Flowers not seen. Fruit ovoid-subglobose, c. 2 mm diameter, slightly furrowed along dissepiment, glabrous or sparsely pubescent, indehiscent or eventually splitting septically the full length of capsule into two pyrenes; calyx lobes spreading, ciliate on margin; beak absent. Seeds depressed obconic, c. 0.5 mm wide; surface dark brown, reticulate-areolate.

Specimens examined: Papua New Guinea. WESTERN PROVINCE: Gaima, Lower Fly River (east bank), Nov 1936, *Brass* 8339 (BRI). Queensland. COOK DISTRICT: Foothills – Thornton Peak, Sep 1937, *Brass & White* 263 (BRI); Daintree River, 1890, *T. Pentzke* [MEL 115133] (MEL); Russell River, 1892, *Johnson* [MEL 115202] (MEL).

Distribution and habitat: *H. novoguineensis* is found in the Western Province of Papua New Guinea. The only overseas material I have seen of this species is the isotype and paratype. In Australia this species is recorded from three localities along the eastern coastline of Queensland from near the base of Thornton Peak to Russell River near Babinda (**Map 13**). The only habitat information recorded for the Australian material is that the species grows in grasslands. Habitat notes from Papua New Guinea record the species growing on river banks 'scrambling amongst grass in dense savannah forest'.

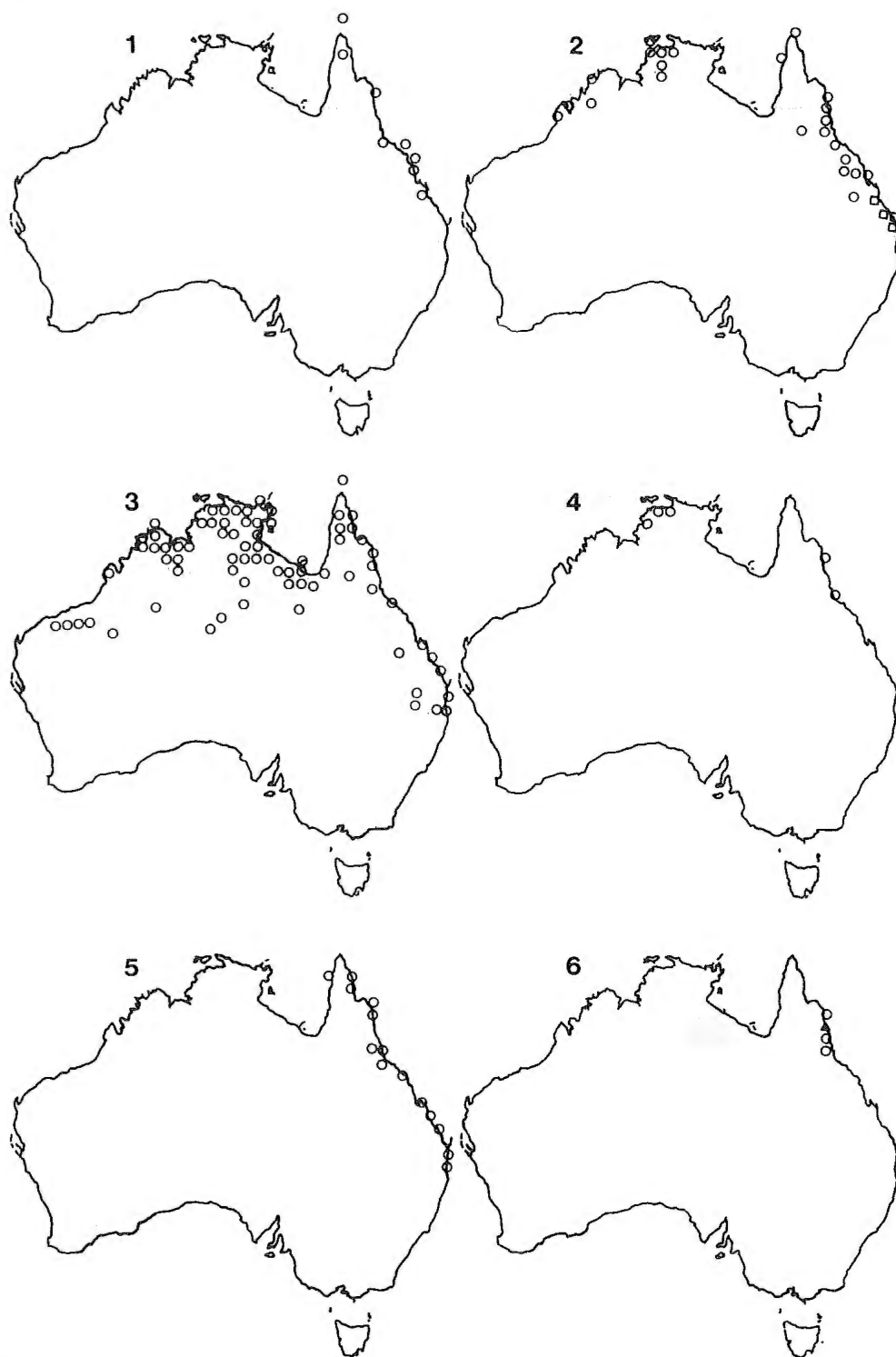
Conservation status: The species has not been collected in Australia since 1937. A broad search of likely localities was undertaken in September 1990 but no new collections were made. A conservation coding of 3K+ is appropriate.

Acknowledgements

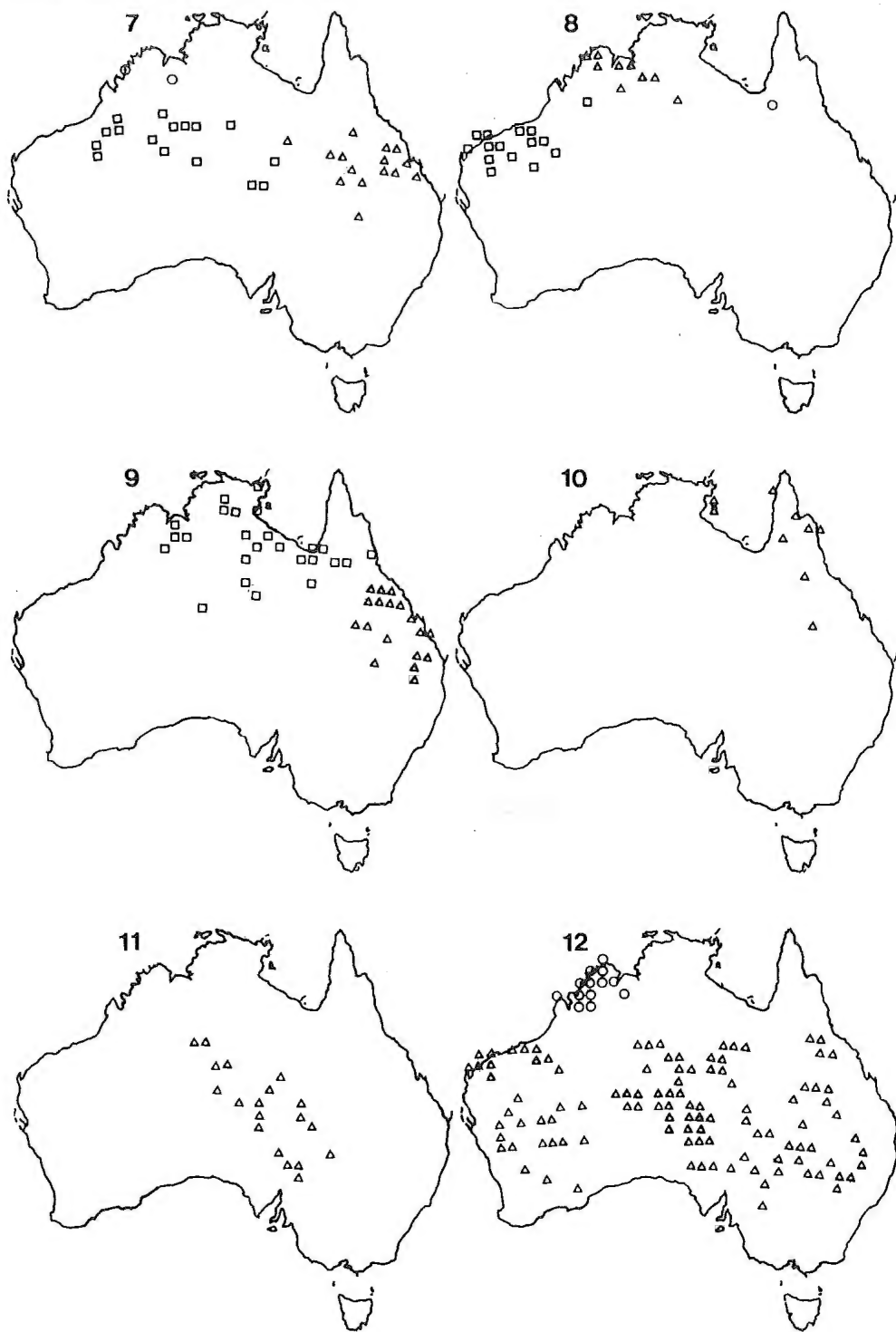
I would like to thank the Directors of AD, BRI, CANB, DNA, G, K, L, MEL, NSW, PERTH and QRS for making material available for study. I would also like to thank Dr T.D. MacFarlane and Dr P.S. Short for their assistance while Australian Botanical Liaison Officers at Kew; Mr L. Pedley for the Latin diagnoses; Mr W. Smith for the illustrations; Mr P. Sharpe for translation of German texts; Mr A. Franks for providing the Scanning Electron Micrographs and Mr R. Henderson, Ms E. Ross and Mr P. Forster for their constructive comments. This work was supported by a grant from the Australian Biological Resources Study (ABRS) in 1990.

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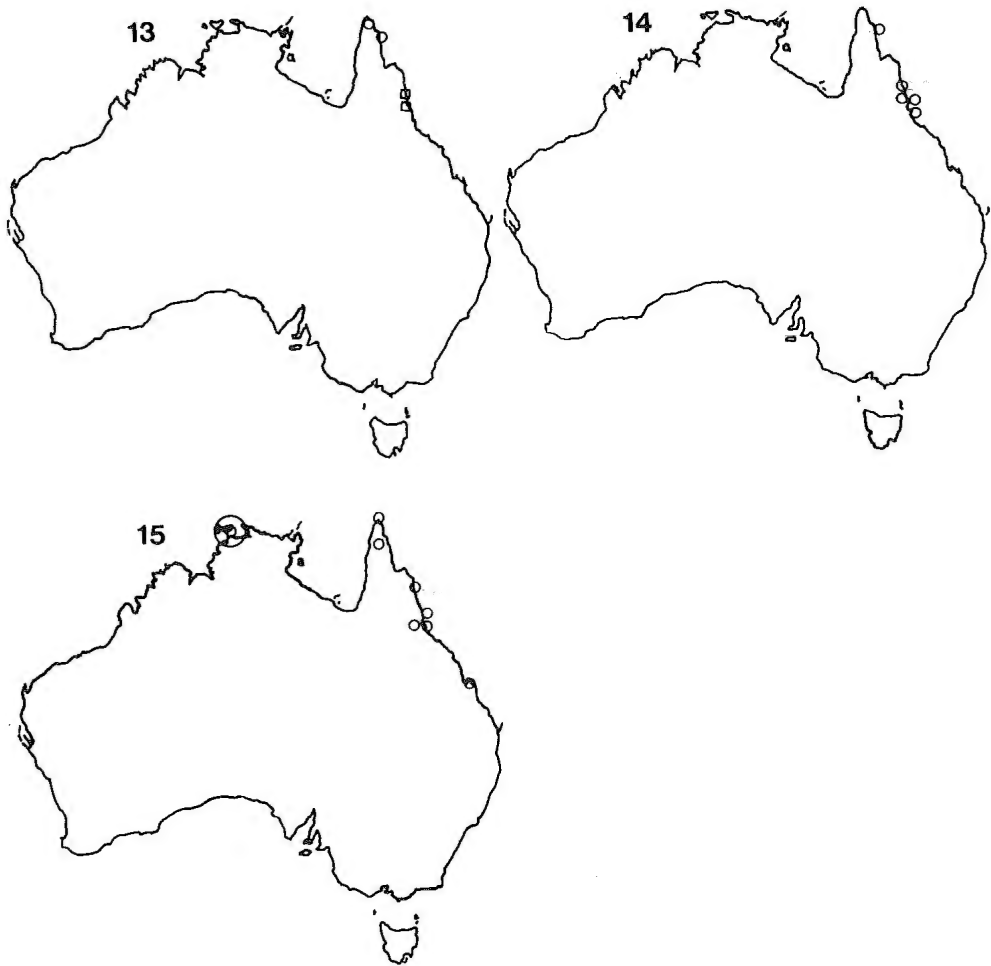
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Maps 1-6. Distribution of *Oldenlandia* taxa: 1. *O. biflora*. 2. *O. corymbosa* var. *corymbosa* ○; *O. corymbosa* var. *caespitosa* □. 3. *O. galioides*. 4. *O. tenuifolia*. 5. *O. subulata*. 6. *O. tenelliflora* var. *papuana* △; *O. polyclada* ○.



Maps 7-12. 7-10. Distribution of *Oldenlandia* taxa: 7. *O. pterospora* □; *O. coerulescens* △; *O. kochiae* ○. 8. *O. crouchiana* □; *O. spermacocoides* △; *O. spathulata* ○. 9. *O. mitrasacmoides* subsp. *mitrasacmoides* □; *O. mitrasacmoides* subsp. *trachymenoides* △. 10. *O. mitrasacmoides* subsp. *nigricans*. 11 & 12 Distribution of *Synaptantha* taxa: 11. *S. tillaeacea* var. *hispidula*. 12. *S. tillaeacea* var. *tillaeacea* △; *S. scleranthoides* ○.



Maps 13–15. Distribution of *Hedyotis* taxa: 13. *H. philippensis* ○; *H. novoguineensis* □. 14. *H. radicans*. 15. *H. auricularia* var. *melanesica*.

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A NEW *PASPALUM* L. (GRAMINEAE) FROM NEW CALEDONIA AND VANUATU

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Summary

Paspalum moratii sp. nov. is described and its relationship with allied species is discussed.

Introduction

The genus *Paspalum* L. (Gramineae) is represented in New Caledonia by about 13 species (Toutain 1989). Four of them, presumably indigenous, are mentioned in accounts of the vegetation of many Pacific islands including those of Vanuatu. They are *P. orbiculare* G. Forster, *P. cartilagineum* Presl, *P. distichum* L. and *P. vaginatum* Sw. Eight other species were introduced more or less recently from America, mainly for lawns and pastures. They are *P. dilatatum* Poir., *P. urvillei* Steudel, *P. conjugatum* Bergius, *P. paniculatum* L., *P. notatum* Fluegge, *P. sauræ* Parodi, *P. plicatulum* Michx. and *P. wettsteinii* Hack. In Vanuatu, *P. commersonii* Lam. and *P. scrobiculatum* L. are also found. The weed *P. fimbriatum* Kunth is established in some parts of Vanuatu but in New Caledonia it has been collected only once in Noumea.

The material of *Paspalum* from New Caledonia and Vanuatu held in the ORSTOM* Herbarium (NOU) and in the CIRAD laboratory of Port Laguerre has recently been critically re-examined.

In the limited area of these two archipelagoes, each species is quite homogeneous, the characters show a narrow range of variations, and the differences between species are clear, so that local specimens are not particularly difficult to identify. The identifications made were checked against published descriptions of *Paspalum* species in books on tropical grasses (Hitchcock 1936; Bor 1960; Backer & Backhuisen van den Brink 1968; Burkart 1969; Hutchinson & Dalziel 1972; Smith 1979; Koyama 1987; Simon 1990). All species were easily identified, except for one which remained unplaced.

Specimens of this plant sent to botanists in various parts of the world were identified as *P. commersonii*, *P. scrobiculatum*, *P. orbiculare*, and even *P. thunbergii* Kunth ex Steudel! Even though specialists working with dry specimens recognize many similarities when comparing the plant from New Caledonia and Vanuatu with reference material, the varied determinations suggest that it is basically different from these species.

Clayton (1975) encountered difficulties in distinguishing the following five species of African *Paspalum*: *P. scrobiculatum*, *P. commersonii*, *P. polystachyum* R. Br., *P. orbiculare* and *P. cartilagineum*. He concluded that there were not sufficient grounds to separate them and therefore included them in the *Paspalum scrobiculatum* complex whose diagnostic morphological features were given later by Clayton and Renvoize (1982).

The characters used by Clayton coincide with those present in our unplaced *Paspalum* material which hasty identification might thus place in the *P. scrobiculatum* complex. However, such identification does not take into account other particular characters, such as the number of racemes, which is never more than two in the unplaced material, the sterile lemma, which is generally slightly transversely wrinkled, and the upper glume, which is crumpled.

Two further characteristics of this controversial plant are not quite the same as those of *P. scrobiculatum*. The spikelets are somewhat bigger (2.2 to 3.1 mm long as compared with 1.8 to 2.5 mm in *P. scrobiculatum*), and the stigmas are always white, whereas those of *P. scrobiculatum* are generally violet.

* ORSTOM, Institut Français de Recherches Scientifiques pour le Développement en Coopération, Centre de Nouméa.

Growing in the Port Laguerre pasture-plant collection beside a row of *P. orbiculare*, the plant in question showed a rather different vegetative behaviour and frequency of flowering. It appeared much more sensitive to drought and to competition from surrounding grasses than its neighbour and died out in a few years. The culms were only seasonally present and for a much shorter time than those of *P. orbiculare*. However, in the vegetative stage, it was easily confused in the field with plants of the latter species.

All these observed differences are, I believe, sufficient to justify considering this plant a distinct species.

***Paspalum moratii* Toutain sp. nov.**

Gramen perenne caespitosum. Culmi erecti, c. 70 cm alti. Foliorum laminae lineares, 5–25 cm longae et 7–11 mm latae, herbaceae, acuminatae. Ligulae membranaceae, c. 0.8 mm longae. Inflorescentiae unum vel duos racemos gerentes, racemus inferior sessilis et racemus superior breve pedunculatus. Racemi 3.0–7.5 cm longi, in medio latiores. Rhachis plana, 1.5–3.0 mm lata. Spiculae singulares, subrotundae in ambitu, glabrae, 2.2–3.1 mm longae. Gluma inferior deest. Gluma superior spiculam aequans, quinque-nervia, plus minusve corrugata. Floris sterilis lemma quinquenervium, plerumque transversim plicatum, pallide viride. Floris fertilis lemma paleaque spiculam aequantes, induratae, puncticulatae, maturitate nitidae stramineae. Stigma album. **Typus:** Port Laguerre, Nouvelle Calédonie, cultivé en collection, originaire de Koné, prairie sur alluvions anciennes, avril 1985, *B. Toutain* 4028 (holo: P; iso: BRI,NOU).

Erect short-lived perennial, more or less tufted, to about 0.7 m tall. Culms erect with about 6 nodes (3 or 4 clearly visible), sometimes producing a second culm. Leaf blades linear, c. 20 (5–25) cm long, c. 9 (7–11) mm wide, flat, herbaceous, sparsely pilose above and along the margin, glabrous below, gradually long-acuminate. Ligule c. 0.8 mm long, membranous. Sheaths sparsely pilose along the margin. Blades and sheaths become brownish in drying. Inflorescence exserted with (1 or) 2 terminal racemes back to back in the upper sheath before flowering, the lower raceme sessile, the upper on a more or less short peduncle up to 10 mm long, ciliolate at the junction. Racemes 3.0–7.5 cm long, straight or slightly arcuate, moderately thick, wider in the middle than at the base. Rachis c. 2 (1.5–3.0) mm wide, bearing spikelets in 2 rows on one side, flat on the other side. Spikelets on very short pedicels, solitary, broadly ovate or suborbicular in outline, rounded at apex, c. 2.8 (2.2–3.1) mm long, 2.0–2.5 mm wide, glabrous. Lower glume absent. Upper glume rounded, as long as the spikelet, 5-nerved, irregularly crumpled. Sterile lemma membranous, 5-nerved, usually transversely wrinkled near the margin, dull, pale green. Fertile lemma and palea indurate, equalling the spikelet, puncticulate, straw coloured or pale brown and shiny at maturity. Stigma creamy white, light brown when dry. Chromosome number of the type specimen: $2n = 40$ (*S. Essad*, 1989, Versailles, France). **Figs 1 & 2.**

Specimens studied (all in NOU): New Caledonia. Nouméa, base du Ouen Toro, May 1964, *MacKee* 11493; île Ouen, Nov 1965, *Blanchon* 1638; Bourail Nessadiou, Centre Agronomique, Jul 1969, *Schmid* s.n.; La Foa, Ouano, bord de mare, Jul 1969, *Schmid* 2941 bis; Boulouparis, Ouaménie, prairie sur péridotites, May 1970, *Veillon* 2147; La Foa, Pocquereux, prairie sur sol sodique acide, Mar 1985, *Toutain* 4025; Port Laguerre, jardin de collection, Apr 1985, *Toutain* 4107; La Foa, Pocquereux, Apr 1986, *Toutain* 4109. Vanuatu. Efate, côte Sud, Est de la rivière Téouma, marécage à touradons, Jul 1971, *Raynal* 16045.

Distribution and habitat: *P. moratii* is not very common. It grows in grasslands and native pastures on seasonally very wet and very dry soils, usually in association with *P. orbiculare* and other native herbaceous plants. Its distribution suggests that this species is indigenous.

Notes: *Paspalum moratii* cannot be confused with the Asiatic *P. thunbergii* Kunth ex Steudel because that has 2–5 racemes on an elongated axis, and leaf blades densely pilose on both surfaces.

There are some differences between it and the Asiatic species *P. metzii* Steudel whose taxonomic position is somewhat controversial. Both species have white stigmas when living and often a short distance between the racemes.

P. ciliatifolium Michx. is mentioned by Jacques (1939) as a species resembling *P. orbiculare* and collected in New Caledonia by Montrouzier, Pancher and Deplanche. *P.*

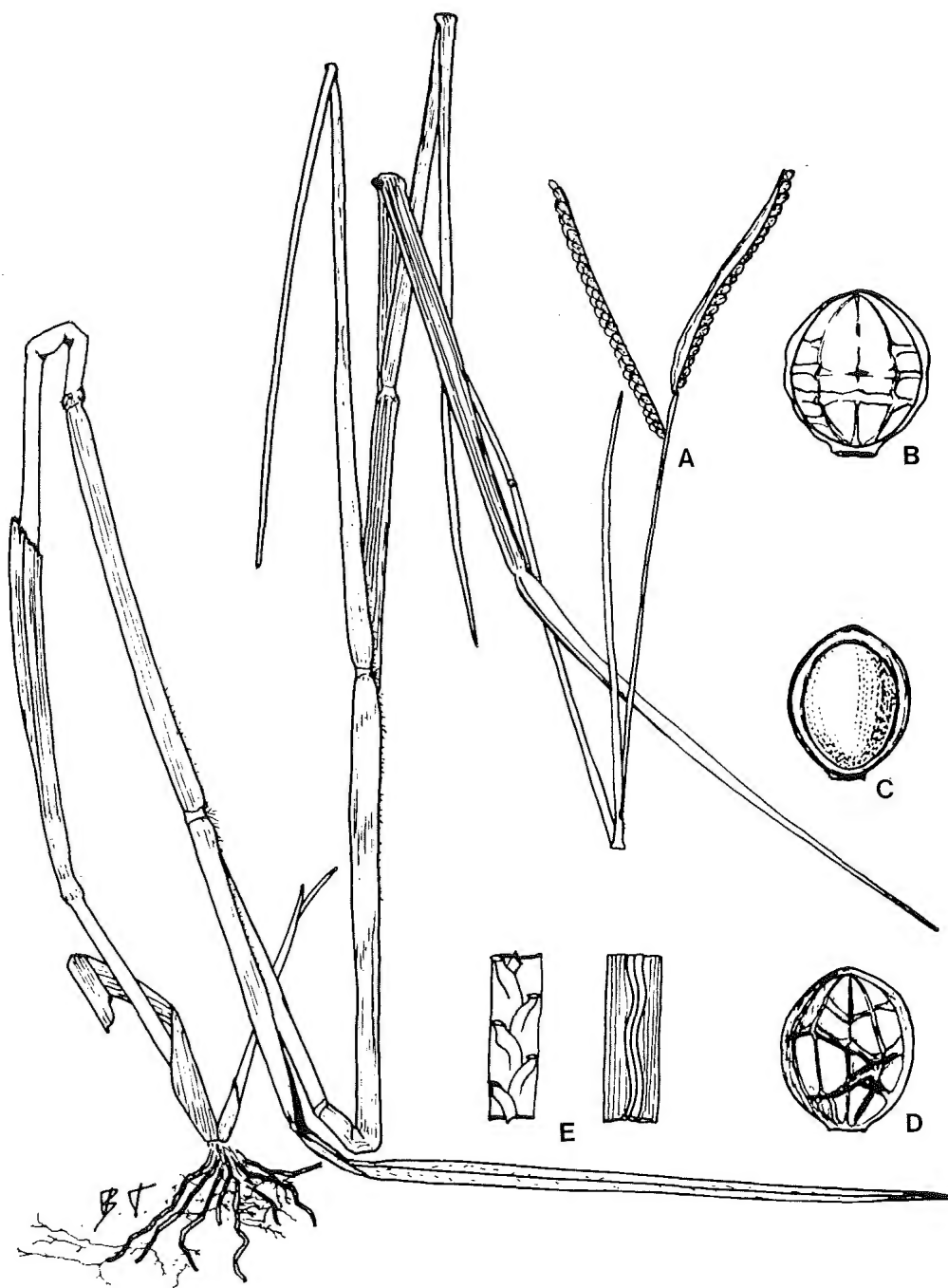


Fig. 1. *Paspalum moratii*: A. culm with typical inflorescence $\times 0.65$. B. lemma of sterile floret, abaxial view $\times 7.5$. C. lemma and palea of fertile floret, abaxial view $\times 7.5$. D. upper glume, adaxial view $\times 7.5$. E. details of part of rachis (left, abaxial view; right, adaxial view) $\times 3$. Del. B. Toutain.

moratii cannot be confused with the American species *P. ciliatifolium*, the latter having 1–3 slender racemes, spikelets about 2 mm long, and somatic chromosome number $2n = 20$. In appearance the spikelet of *P. moratii* is not unlike that of some other American species such as *P. lindenianum* A. Rich. or *P. distortum* Chase.

Key to species

1. Spikelets crumpled and/or transversely wrinkled 2
Spikelets not crumpled 4
2. Spikelets 2 mm long, only 1 raceme [West Indies] **P. distortum**
Spikelets more than 2.2 mm long, 1–2 racemes 3
3. Glume and sterile lemma deeply crumpled, caespitose in dense tussocks
[West Indies] **P. lindenianum**
Sterile lemma transversely wrinkled, glume slightly crumpled, caespitose
in small tufts **P. moratii**
4. Spikelets less than 2.5 mm long 5
Spikelets 2.5 mm long or more 9
5. Racemes 1–3 6
Racemes 2–10, distant 7
6. Racemes arcuate, spikelets glabrous or minutely pubescent, 2 mm long
[North and Central America] **P. ciliatifolium**
Racemes straight, spikelets glabrous, 2.0–2.5 mm long, 7-nerved [Tropical
Asia] **P. metzii**¹
7. Spikelets 2.0–2.5 mm long, rotundate elliptic, 5–7-nerved **P. commersonii**¹
Spikelets about 2 mm long, orbicular 8
8. Sterile lemma more or less cartilaginous, 2–3 racemes **P. cartilagineum**¹
Sterile lemma membranous, spikelets 3-nerved **P. orbiculare**¹
9. Racemes 3–5, spikelets elliptic, mucronate at apex, glabrous or pubescent
[China, Japan] **P. thunbergii**
Racemes 2, V-shaped 10
10. Spikelets ovate, rhizomes stout **P. notatum**
Spikelets acute, rhizomes slender 11
11. Glume shortly hairy, fresh water **P. distichum**
Glume hairless, salt water **P. vaginatum**

¹ included in *P. scrobiculatum* complex

Etymology: This species is dedicated to Prof. Philippe Morat, botanist and agrostologist, Director of the Laboratoire de Phanérogamie at the Muséum National d'Histoire Naturelle in Paris. He spent several years in New Caledonia, in charge of the ORSTOM laboratory of botany, and contributed to our understanding of plants of that island.

Aknowledgements

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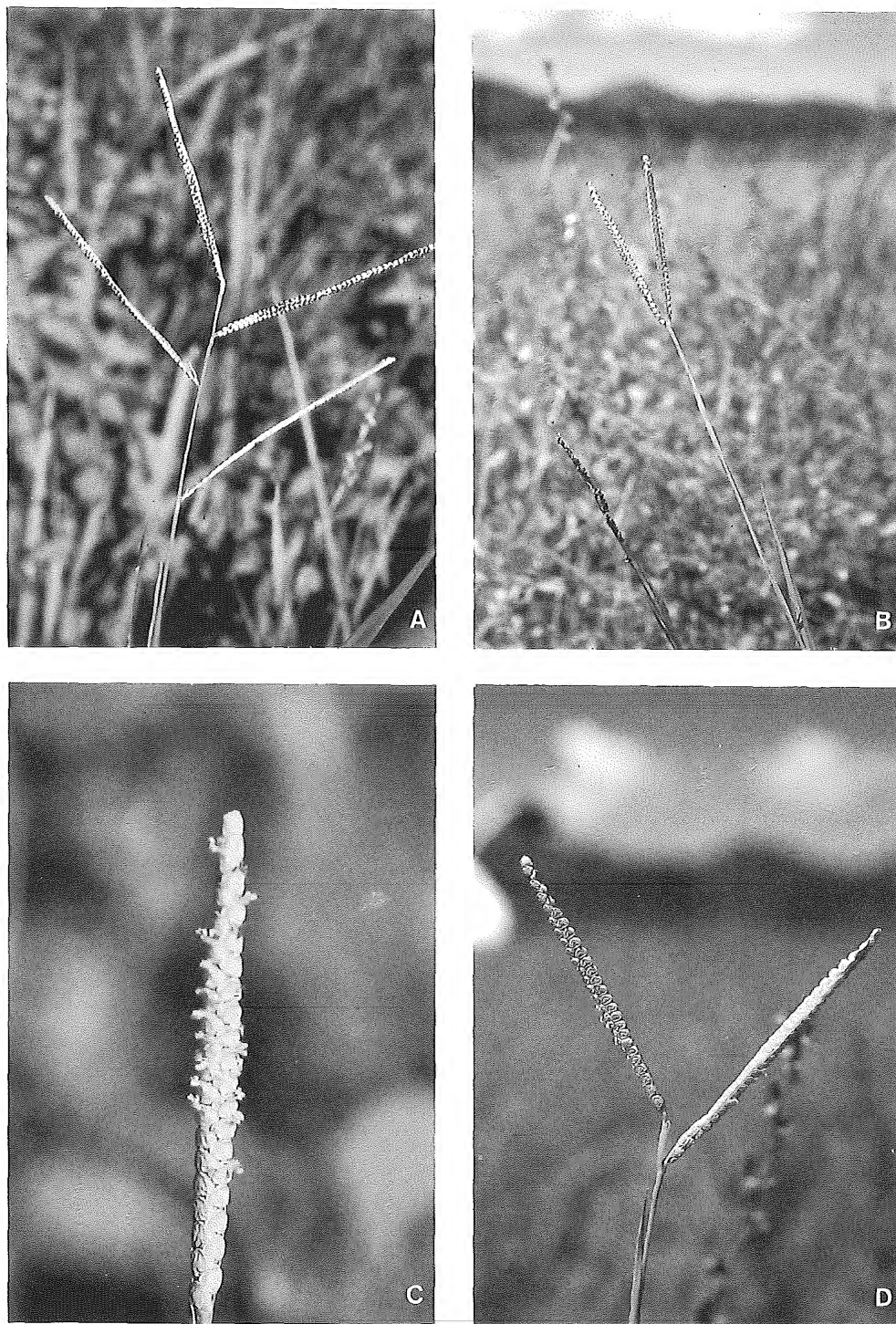


Fig. 2. *Paspalum orbiculare*: A. culm apex at flowering. B-D. *Paspalum moratii*: B,D culm apex at flowering. C. abaxial view of a single raceme.

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FIVE NEW SPECIES OF *PLECTRANTHUS* L. HERIT (LAMIACEAE) FROM QUEENSLAND

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Summary

Plectranthus graniticola, *P. minutus*, *P. nitidus*, *P. omissus* and *P. torrenticola* are described as new. All are endemic to Queensland except for *P. nitidus* which also occurs in New South Wales. All are restricted in distribution and are endangered species. A new description is provided for *P. argentatus* S.T. Blake to compare it with the allied species – *P. graniticola*, *P. omissus* and *P. torrenticola*. New localities for *P. gratus* S.T. Blake and *P. amicum* S.T. Blake in Queensland are recorded and both species are allocated conservation codings. A new locality for *P. arenicola* P. Forster is recorded and the species is allocated a revised conservation coding. *P. amboinicus* (Lour.) Sprengel is recorded as naturalised in the Brisbane area. A key to the native and naturalised species of *Plectranthus* occurring in Queensland is presented.

Introduction

Since the revision of *Plectranthus* L. Herit. in Australasia by Blake (1971), relatively few collections of the genus have been added to the holdings at the Queensland Herbarium and some confusion has reigned among collectors as to the identity of a number of their recent collections from Queensland. In previous papers (Forster 1991a, 1992), two new Queensland species, *P. arenicola* P. Forster ('arenicolus') and *P. blakei* P. Forster, were named and compared with allied taxa. A putative hybrid between *P. alloplectus* and *P. graveolens* has also been documented (Forster 1991b).

Recent fieldwork in Queensland has revealed the existence of a further five new species, new localities for several rarely collected previously described species and the naturalisation of a south-east Asian species. A key to all species of the genus in Queensland is provided. As three of the new species, namely *P. graniticola*, *P. torrenticola* and *P. omissus* are superficially similar and likely to be confused with *P. argentatus* S.T. Blake, a new comparative account is also given for the latter species.

Characters that are important in distinguishing species of *Plectranthus* in Queensland include the presence/absence of an indumentum of trichomes; the type of indumentum (stalked multicellular trichomes with an apical gland (referred to throughout as 'glandular'), stalked multicellular trichomes lacking an apical gland (referred to throughout as 'non-glandular'); presence/absence of sessile glands and the number of cells in the sessile glands when present; the number of teeth on each margin of the leaf lamina; the number of flowers in each verticillaster; corolla lobe size and shape, corolla tube shape and the nature of the indumentum on the corolla. Most of these characters were used and emphasised by Blake (1971) in his delimitation of species. However, because his key does not consist of strictly dichotomous couplets, the usefulness of these attributes has been largely obscured and botanists seeking identification of material using the key have usually experienced problems in reaching a successful answer.

Most taxa, apart from *P. minutus*, are in cultivation and propagating material has been distributed to several interested growers and the Australian National Botanic Gardens. Interested parties should contact the author for propagating material.

In the following descriptions, indumentum cover is described using the terminology of Hewson (1988), except that 'scattered' is used instead of 'isolated'. Unless otherwise stated, trichomes are clear and not coloured.

Taxonomic Treatment

1. *Plectranthus torrenticola* P. Forster, **sp. nov.** affinis *P. graveolenti* R. Br. a quo foliis argenteis, verticillastris 10–12-floris, corolla 9.8–1.2 mm longa, calyce fructificanti 5.4–6.0 mm longo differt. **Typus:** Queensland. MORETON DISTRICT: State Forest Drive, 20 February 1991, *P.I. Forster* 7797 & *P.R. Sharpe* (holo: BRI!; iso: CANB!, K!, MEL!, NSW!).

Subshrub to 30 cm high, foliage slightly scented. Stems or lateral branches erect to straggling, the lower parts woody and up to 5 mm thick, seedling-derived stems lacking a tuberous base; upper parts with dense, retrorse, 5–8-celled non-glandular silver trichomes to 0.4 mm long, lacking glandular trichomes and sessile glands. Leaves discolorous; petiole 8–18 mm long, 2–3 mm wide, with dense, divaricate, 5–8-celled non-glandular silver trichomes to 0.4 mm long, dense glandular trichomes to 0.1 mm long, lacking sessile glands; lamina narrow-ovate, 20–60 mm long, 2–5 mm wide, fleshy, serrate with 10–16 teeth on each margin, occasionally with 1 or more secondary teeth; upper surface green, veins impressed, with sparse to dense, retrorse, 4–8-celled glandular and non-glandular silver trichomes to 0.4 mm long, lacking sessile glands; lower surface pale-green, veins raised, with dense, retrorse, 5–8-celled non-glandular silver trichomes to 0.4 mm long, dense glandular silver trichomes to 0.1 mm long, lacking sessile glands. Inflorescence cymose, 20–30 cm long, comprising 1–3(5) pedunculate branches; each branch 4–18 cm long; axis with dense, retrorse, 4–8-celled non-glandular silver trichomes to 0.4 mm long and glandular silver trichomes to 0.1 mm long, sessile glands lacking; bracts broad-ovate, 4.3–4.5 mm long, 4.9–5 mm wide, with dense, retrorse, 4–8-celled non-glandular and glandular silver trichomes to 0.4 mm long, lacking sessile glands. Verticillasters 10–12-flowered, 4–11 mm apart; pedicels 3–5 mm long, c. 0.3 mm diameter, with sparse, antrorse, 4–8-celled non-glandular and glandular silver trichomes, sessile glands absent. Calyx 1.8–2.1 mm long, with sparse to dense, antrorse, 2–4-celled non-glandular and glandular trichomes to 0.4 mm long, sessile glands absent. Corolla 9.8–12.2 mm long, light-purple; tube 5.3–6.0 mm long, abruptly curved at an angle of c. 30° 2.1–2.2 mm from base, slightly inflated upwards, glabrous; upper lobes subcircular, 1.7–2.1 mm long, 1.9–2.2 mm wide, with scattered, divaricate, 2–4-celled non-glandular trichomes on margins, lacking glandular trichomes and sessile glands; lateral lobes broadly-ovate, 0.9–1.0 mm long, 0.9–1.0 mm wide, lacking trichomes and sessile glands; lower lobe oblong, 4.6–5.6 mm long, 2.7–4.5 mm wide, with scattered, retrorse, 2–4-celled non-glandular trichomes up to 0.2 mm long, lacking glandular trichomes and sessile glands. Filaments filiform, 8–9 mm long, fused for c. 5 mm in bottom of tube, purple; anthers c. 0.3 mm long and 0.2 mm wide. Style 8.5–9.5 mm long, purple. Fruiting calyx 5.4–6.0 mm long; upper lobe ovate, 3.0–3.2 mm long, 2.3–2.4 mm wide, with sparse, antrorse, 2–4-celled non-glandular trichomes to 0.2 mm long, lacking glandular trichomes and sessile glands; lateral lobes lanceolate-falcate, 3.0–3.2 mm long, c. 0.6 mm wide, with scattered, divaricate, 2–4-celled non-glandular trichomes to 0.2 mm long, lacking glandular trichomes and sessile glands; lower lobes lanceolate-falcate, 3.5–3.8 mm long, c. 0.6 mm wide, with scattered, divaricate, 2–4-celled non-glandular trichomes to 0.2 mm long, lacking glandular trichomes and sessile glands. Seed semi-spherical, c. 0.8 mm long, 0.8 mm wide, 0.5 mm thick, brown. **Fig. 1C & D.**

Specimens examined. Queensland. MORETON DISTRICT: N of Mapleton, Apr 1987, *Sharpe* 4676 & *Tan* (BRI); N of Mapleton, Jun 1984, *Hadlow* 375 (CBG); S of Mapleton, Apr 1989, *Sharpe* 4867 (BRI); near Kondalilla National Park, Feb 1991, *Forster* 7795 & *Sharpe* (BRI,MEL); Bli Bli, Aug 1991, *Leiper* s.n. (BRI).

Distribution and habitat: Known from the Blackall Range north of Nambour and near Bli Bli. Plants grow in open heathland on rock outcrops, often but not exclusively near water, along the edges of rainforest or along the edges of open eucalypt forest. At one locality, *P. parviflorus* Willd. grows in association with *P. torrenticola*, whereas at another locality, *P. graveolens* R. Br. is present with it.

Notes: *P. torrenticola* is vegetatively superficially similar and probably most closely allied to *P. argentatus* S.T. Blake, *P. graniticola* P. Forster and *P. omissus* P. Forster, but differs from them in a number of characters that are compared in **Table 1**. In Blake's key (1971), *P. torrenticola* keys to *P. graveolens* but differs from that species by its silver foliage, the 10–12 flowers in each verticillaster, the corolla 9.8–12.2 mm long and the fruiting calyx 5.4–6 mm long. *P. torrenticola* also lacks 4-celled sessile glands which are unique to *P. argentatus* and *P. omissus* in the taxa occurring in south-east Queensland. Further studies using non-morphological characters are required to evaluate relationships within this group of taxa.

Conservation status: This is a most uncommon plant and is under direct threat because several localities where it occurs experience considerable disturbance from human visitation. Further survey work is required in similar habitats in the Blackall Range to

Table 1. Comparison of morphological characters of *Plectranthus argentatus*, *P. graniticola*, *P. omissus* and *P. torrenticola*

| Character | <i>argentatus</i> | <i>omissus</i> | <i>torrenticola</i> | <i>graniticola</i> |
|--|----------------------|-------------------|---------------------|--------------------|
| 4-celled sessile glands | present | present | absent | absent |
| flower no. in verticillaster | 6–10 | 14–16 | 10–12 | 14–16 |
| corolla colour | white to lilac-white | lilac-blue | lilac | purple |
| corolla tube angle (°) | 0–10 | 110–130 | 30 | 40–45 |
| corolla tube length (mm) | 5–5.1 | 4.8–5 | 9.8–12.2 | 5.5–6 |
| trichomes on corolla tube | absent | present | absent | present |
| sessile glands on corolla tube | absent | present | absent | absent |
| corolla upper lobes size (length × width mm) | 1.4–1.5 × 1.5–1.7 | 2.4–2.5 × 2.4–2.5 | 1.7–2.1 × 1.9–2.2 | 2.3–2.5 × 2.8–3 |
| corolla lower lobe size (length × width mm) | 4–4.2 × 4–4.2 | 4.4–4.5 × 3–3.2 | 4.6–5.6 × 2.7–4.5 | 6.3–6.8 × 4–4.2 |

determine whether other populations of this species exist there. An appropriate conservation coding is 2EC (cf. Briggs & Leigh 1988).

Etymology: The specific epithet from *torrens* (torrent) and *cola* (dweller) alludes to the common preference of this species to growing in rock outcrops next to rushing streams (torrents).

2. *Plectranthus omissus* P. Forster, sp. nov. affinis *P. argenteo* S.T. Blake a quo verticillastris 14–16-floribus, floribus lilacinis, corollae tubo 4.8–5.0 mm longo ad angulum 110–130° c. 1.4 mm e basi deflexo, uterque trichomatibus et glandulis sessilibus, lobis superioribus 2.4–2.5 mm longis et 2.4–2.5 mm latis, labeo inferiore longiore quam lato, 4.4–4.5 mm longo, 3.0–3.2 mm lato differt. **Typus:** Queensland. WIDE BAY DISTRICT: Mudlow Gap, Beauty Spot 11, Timber Reserve 26, 8 km N of Kilkivan, 21 February 1989, *P.I. Forster* 4977 (holo: BRI!; iso: CANB!, K!, MO!).

Subshrub to 1 m high, foliage slightly scented. Stems and lateral branches erect or straggling, the lower parts woody and up to 1 cm thick, seedling stems lacking tuberous bases; upper parts with sparse to dense, retrorse, 6–8-celled non-glandular silver trichomes up to 0.6 mm long but commonly much shorter, lacking glandular trichomes, with sparse sessile 4-celled glands. Leaves concolorous, green; petioles 25–36 mm long, 3.8–4.0 mm diameter, with dense, divaricate, 6–8-celled non-glandular silver trichomes to 0.6 mm long, lacking glandular trichomes, with sparse to dense sessile 4-celled glands; lamina broadly ovate, 2–8 cm long, 3–6 cm wide, somewhat fleshy, serrate with 17–19 teeth on each margin, occasionally with 1 or more secondary teeth; upper surface with venation impressed and with dense, retrorse, 6–8-celled non-glandular silver trichomes to 0.6 mm long, lacking glandular trichomes, with sparse to dense sessile 4-celled glands; lower surface with venation raised and with dense, retrorse, 6–8-celled non-glandular silver trichomes to 0.6 mm long, lacking glandular trichomes, with dense sessile 4-celled glands. Inflorescence cymose, comprising 1–5 branches with occasional side branches; each branch pedunculate, 15–35 cm long; axis with sparse to dense, retrorse, 6–8-celled non-glandular silver trichomes to 0.4 mm long, lacking glandular trichomes, with sparse to dense sessile 4-celled glands; bracts lanceolate, 2.3–2.4 mm long, 0.9–1.0 mm wide, with dense, retrorse, 6–8-celled non-glandular trichomes to 0.2 mm long, lacking glandular trichomes, with dense sessile 4-celled glands. Verticillasters 14–16-flowered, 8–13 mm apart; pedicels 3.0–3.4 mm long, c. 0.3 mm diameter, with dense, ± retrorse, 6-celled non-glandular trichomes to 0.2 mm long, lacking glandular trichomes, with scattered sessile 4-celled glands. Calyx 2.6–2.8 mm long, with dense, retrorse, 6–8-celled non-glandular trichomes to 0.4 mm long, lacking glandular trichomes, with dense sessile 4-celled glands. Corolla 8.5–8.8 mm long, lilac; tube 4.8–5.0 mm long, abruptly curved at

an angle of 110–130° c. 1.4 mm from base, slightly inflated upwards and then constricted to the slightly oblique mouth, with scattered, divaricate, 4–6-celled non-glandular trichomes to 0.4 mm long, lacking glandular trichomes, with scattered sessile 4-celled glands; upper lobes subcircular, 2.4–2.5 mm long, 2.4–2.5 mm wide, with sparse, divaricate, 4–6-celled non-glandular trichomes to 0.4 mm long, lacking glandular trichomes, with sparse sessile 4-celled glands; lateral lobes ovate, 1.0–1.2 mm long, c. 0.8 mm wide, lacking non-glandular and glandular trichomes, with scattered sessile 4-celled glands; lower lobe oblong, 4.4–4.5 mm long, 3.0–3.2 mm wide, with scattered, divaricate, 4–6-celled non-glandular trichomes to 0.4 mm long, lacking glandular trichomes, with sparse sessile 4-celled glands. Filaments filiform, 6–7 mm long, fused to tube in bottom 2–3 mm, lilac; anthers 0.4–0.5 mm long, c. 0.3 mm wide. Style 3.0–3.5 mm long, lilac. Fruiting calyx 4.0–4.8 mm long, all lobes with dense, retrorse, 4–6-celled non-glandular trichomes to 0.4 mm long, lacking glandular trichomes, with dense sessile 4-celled glands; upper lobe lanceolate-triangular, 1.7–1.8 mm long, 1.2–1.4 mm wide; lateral lobes lanceolate-falcate, 1.3–1.5 mm long, c. 1.2 mm wide; lower lobes lanceolate-falcate, 2.4–2.5 mm long, 0.5–0.6 mm wide. Seed hemi-spherical, 0.7–0.8 mm long, c. 0.7 mm wide, 0.4 mm thick. **Fig. 11 & J.**

Specimens examined: Known only from the type collection.

Distribution and habitat: Known only from the type locality, where plants grow on south-facing rock outcrops bordering araucarian notophyll vine forest at an altitude of c. 240 m.

Notes: *P. omissus* was previously considered to be a northerly outlying population of *P. argentatus* (Forster & Sharpe 1989). However, more recent collections of this latter species led me to reconsider the material from Mudlow Gap, whereupon several diagnostic characters that could be used to distinguish the two species were recognised (**Table 1**). *P. omissus* is also superficially similar to *P. graniticola* and *P. torrenticola*, but may be distinguished from those taxa by a number of characters (**Table 1**).

Conservation status: The only known population of *P. omissus* comprises 30 to 40 plants on a steep rock outcrop adjacent to an old logging road in a designated Beauty Spot within a Queensland Forest Service Timber Reserve. The immediate area is infested with *Lantana camara* and *Ageratum houstonianum* and further exploration is required to determine whether additional populations occur. An appropriate conservation coding for *P. omissus* is 1E (cf. Briggs & Leigh 1988).

Etymology: The specific epithet *omissus* (neglected) alludes to the overlooked nature of the species, both from its late discovery and from my initial reluctance to acknowledge its uniqueness.

3. *Plectranthus graniticola* P. Forster, sp. nov. affinis *P. omissus* P. Forster a quo glandulis sessilibus 8-cellularibus, corolla 12–13 mm longo constanti ex tubo 5.5–6.0 mm longo c. 3 mm e basi ad angulum 40–45° abrupte defracto, lobo inferiore 6.3–6.8 mm longo, 4.0–4.2 mm lato, sparso usque denso indumento non glandulare ornato et glandulis sessilibus carenti differt. **Typus:** Queensland. SOUTH KENNEDY DISTRICT: Clarke Range, Eungella National Park, 23 April 1991, *P.I. Forster 8056 & W.J.F. McDonald* (holo: BRI!; iso: K!, MEL!, QRS!).

Subshrub to 40 cm high, foliage scentless. Stems and lateral branches erect to straggling, the lower parts woody and up to 8 mm thick, seedling stems lacking tuberous bases; upper parts with dense, retrorse, 4–8-celled non-glandular silver trichomes up to 0.8 mm long but commonly much shorter, lacking glandular trichomes, with very scattered sessile 8-celled glands. Leaves concolorous, green; petioles 2–45 mm long, 1–2 mm diameter, with dense, retrorse 4–8-celled non-glandular silver trichomes to 0.8 mm long, lacking glandular and sessile glands; lamina lanceolate-ovate, 13–70 mm long, 6–50 mm wide, somewhat fleshy, serrate with 15–18 teeth on each margin, occasionally with 1 or more secondary teeth; upper surface with venation impressed and with sparse to dense, antrorse 4–8-celled non-glandular silver trichomes to 8 mm long, lacking glandular trichomes, with scattered 8-celled sessile glands; lower surface with venation raised and with dense divaricate to retrorse 4–8-celled non-glandular silver trichomes to 0.8 mm long, lacking glandular trichomes, with dense sessile 8-celled glands. Inflorescence cymose, comprising

1–3 branches; each branch pedunculate, 5–17 cm long; axis with dense, retrorse 4–8-celled non-glandular silver trichomes to 1 mm long, lacking glandular trichomes and sessile glands; bracts lanceolate-ovate, 1.5–1.8 mm long, 1.2–1.4 mm wide, with dense, divaricate 4–8-celled non-glandular trichomes to 0.1 mm long, lacking glandular trichomes, with dense sessile 8-celled glands. Verticillasters 14–16-flowered, 5–13 mm apart; pedicels 5–6 mm long, c. 0.4 mm diameter, with dense, divaricate 4–8-celled non-glandular trichomes to 0.8 mm long, lacking glandular trichomes and sessile glands. Calyx 3.3–3.5 mm long, with dense, divaricate 4–8-celled non-glandular trichomes to 1 mm long, lacking glandular trichomes and sessile glands. Corolla 12–13 mm long, purple; tube 5.5–6.0 mm long, abruptly curved at an angle of 40–45° c. 3 mm from base, slightly inflated upwards and then constricted to the slightly oblique mouth, with scattered, divaricate, 4-celled non-glandular trichomes to 0.4 mm long, lacking glandular trichomes and sessile glands; upper lobes subcircular 2.3–2.5 mm long, 2.8–3.0 mm wide, ciliate and with dense, divaricate, 4-celled non-glandular trichomes to 0.4 mm long, lacking glandular trichomes and sessile glands; lateral lobes rounded-oblong, 1.2–1.4 mm long, 1.0–1.2 mm wide, lacking trichomes, with scattered 8-celled sessile glands; lower lobe oblong, 6.3–6.8 mm long, 4.0–4.2 mm wide, with sparse to dense, divaricate, 4–6-celled non-glandular trichomes to 0.6 mm long, lacking glandular trichomes and sessile glands. Filaments filiform, 10–11 mm long, lilac; fused to tube in bottom 4–5 mm; anthers 0.6–0.7 mm long, c. 0.4 mm wide. Style 10–11 mm long, lilac. Fruiting calyx 5.5–6.0 mm long, all lobes with dense, antrorse, 4–8-celled non-glandular trichomes to 0.8 mm long, lacking glandular trichomes, with scattered to sparse 8-celled sessile glands; upper lobe rounded, 2.7–2.9 mm long, 2.3–2.4 mm wide; lateral lobes falcate-ovate 2.3–2.5 mm long, 1.3–1.4 mm wide; lower lobes falcate-ovate, 2.3–2.8 mm long, c. 0.4 mm wide. Seed semi-spherical, 1.2–1.3 mm long, c. 1 mm wide and 0.9 mm thick, brown. **Fig. 1G & H.**

Specimens examined: Queensland. SOUTH KENNEDY DISTRICT: Mt Dalrymple summit, Eungella National Park, Apr 1991, Telford 11167 (BRI,CBG).

Distribution and habitat: Known only from Eungella National Park, Clarke Range in central Queensland. Plants grow on granite rock outcrops above 700 m altitude, generally bordering notophyll vineforests and usually in full sun.

Conservation status: It seems remarkable that this species has not previously been collected (no collections in BRI,CANB,CBG,QRS) and was then coincidentally collected from two localities in the Eungella National Park on the same day by different collectors. Undoubtedly the long-time gazettal of this area as National Park has discouraged collectors from officially documenting its flora. Apart from the two cited localities, there is also a population present at Skywindow, Eungella National Park; however, the sheer precipice it occurs on precluded my collecting it on that particular occasion. It is probable that additional populations of it occur in suitable habitats around the entire scarp of the Eungella plateau but further survey work is required to confirm this. An appropriate conservation coding is 2EC (cf. Briggs & Leigh 1988).

Etymology: The specific epithet refers to the occurrence of this species on exposed granite rock outcrops.

4. *Plectranthus argentatus* S.T. Blake, Contrib. Queensl. Herb. 9: 27 (1971). Type: Queensland. MORETON DISTRICT: Mt Roberts, McPherson Range, May 1955, S.T. Blake 19803 (holo: BRI!).

Subshrub to 60 cm high; foliage scentless. Stems or lateral branches erect to straggling, the lower parts woody and up to 7 mm thick, seedling derived stems lacking a tuberous base, pink to green; upper parts with dense, retrorse, 4–8-celled non-glandular silver trichomes to 0.6 mm long, lacking glandular trichomes, with dense 4-celled sessile glands. Leaves concolorous, silver-green; petioles 4–35 mm long, 1.5–4.0 mm wide, with sparse to dense, retrorse, 4–8-celled non-glandular silver trichomes to 0.8 mm long, lacking glandular trichomes, with scattered 4-celled sessile glands; lamina ovate, 3–8 mm long, 2–6 mm wide, fleshy, serrate with 12–28 leaf teeth on each margin, occasionally with 1 or more secondary teeth; upper surface with veins impressed and with sparse to dense, antrorse, 4–8-celled non-glandular silver trichomes to 0.6 mm long, with widely scattered glandular trichomes to 0.1 mm long, with scattered 4-celled sessile glands; lower surface

with veins raised and with sparse to dense, retrorse to divaricate, 4–8-celled non-glandular silver trichomes to 0.8 mm long, lacking glandular trichomes, with sparse to dense 4-celled sessile glands. Inflorescence cymose, 5–19 cm long, comprising 1–3 pedunculate branches, each branch 3–18 cm long; axis with dense, retrorse, 4–8-celled non-glandular trichomes to 0.6 mm long, lacking glandular trichomes, with dense 4-celled sessile glands; bracts narrow-ovate, 2.5–3.7 mm long, 1.3–1.5 mm wide, with sparse, retrorse, 4–8-celled non-glandular trichomes to 0.6 mm long, lacking non-glandular trichomes, with scattered 4-celled sessile glands. Verticillasters 6–10-flowered, 5–25 mm apart; pedicels 2.6–5.0 mm long, c. 0.4 mm diameter, with sparse to dense, retrorse to divaricate, 4-celled non-glandular trichomes to 0.5 mm long, lacking non-glandular trichomes and sessile glands. Calyx 2.4–3.4 mm long, with sparse to dense, divaricate, 4–8-celled non-glandular trichomes to 0.8 mm long, lacking glandular trichomes, with dense 4-celled sessile glands. Corolla 5–10 mm long, white to lilac-white; tube 3.5–5.1 mm long, \pm straight, glabrous, lacking sessile glands; upper lobes subcircular, 1.4–2.2 mm long, 1.5–2.3 mm wide, with scattered to sparse, divaricate, 2–4-celled non-glandular trichomes to 0.2 mm long, lacking glandular trichomes and with scattered to sparse 4-celled sessile glands; lateral lobes oblong, 0.8–1.5 mm long, 0.6–1.0 mm wide, glabrous, lacking sessile glands; lower lobe oblong, 4.0–4.8 mm long, 4.0–4.5 mm wide, with scattered, divaricate, 2–4-celled non-glandular trichomes to 0.2 mm long, lacking glandular trichomes, with 4-celled sessile glands. Filaments 8–10 mm long, filiform, white to pale lilac, fused to tube in lower 3–4 mm; anthers 0.5–0.6 mm long, c. 0.3 mm diameter. Style 7–10 mm long, white to pale lilac. Fruiting calyx 3.7–4.1 mm long, all lobes with sparse, divaricate, 4-celled non-glandular trichomes to 0.5 mm long, lacking glandular trichomes, with sparse 4-celled sessile glands; upper lobe ovate, 2.0–2.3 mm long, 1.5–1.8 mm wide, lateral lobes lanceolate-falcate, 1.9–2.1 mm long, 1.1–1.4 mm wide; lower lobes lanceolate-falcate, 2.0–2.5 mm long, 0.6–0.7 mm wide. Seed semi-spherical, 1.0–1.1 mm long, 0.8–0.9 mm wide, 0.5–0.6 mm thick. **Fig. 1A & B.**

Specimens examined (additional to those cited by Blake 1971): **Queensland.** DARLING DOWNS DISTRICT: Mt Mitchell, Cunningham's Gap, Great Dividing Range, NE of Warwick, May 1970, *Telford* 1530 (CBG); Wilson's Peak, Great Dividing Range, May 1969, *Telford* 480 (CBG); The Head, NE of Killarney, Mar 1980, *Bird & Williams* [AQ331886] (BRI); Spring Creek Plateau, 13 km ENE of Killarney, Sep 1973, *Telford* 3211 (CBG). MORETON DISTRICT: Springbrook Plateau, Feb 1991, *Forster* 7808 & *Leiper* (BRI); Double Peak, Mt Ballow area, McPherson Range, Sep 1990, *Forster* 7437B & *Leiper* (BRI); Mt Lindesay, Nov 1990, *Forster* 7572 & *Orford* (BRI). **New South Wales:** Moss Gardens, 6.5 km SW of Wilsons Peak, Jan 1986, *Forster* 2296 & *Bird* (BRI); cultivated at Rainworth (ex plant collected at Hanging Rock Road, Mebbin State Forest), Apr 1989, *Forster* 1923 (BRI, MEL, NSW).

Distribution and habitat: Restricted to the border ranges in Queensland and to adjacent parts of New South Wales. Plants grow on rock outcrops along rainforest margins and on exposed cliffs at altitudes above 800 m.

Conservation status: Although this species is endemic to the Border Ranges, it is relatively abundant in many localities within National Parks and does not warrant a conservation coding. (cf. *Forster & Sharpe* 1989).

5. *Plectranthus minutus* P. Forster, sp. nov. affinis *P. grato* S.T. Blake a quo folii lamina anguste ovata usque obovata serrata non nisi in dimidio superiore, dentibus folii 4 vel 5 paribus, glandulibus sessilibus 4-cellularibus, sine pilis glanduliferis, verticillastris 4–6-floris differt. **Typus:** Queensland. COOK DISTRICT: Mount Mulligan, a mesozoic sandstone mountain c. 40 km NW of Dimbulah, c. 0.5 km SE of the dam on the top of the mountain, 17 April 1985, *J.R. Clarkson* 5902 (holo: BRI!; iso: MBA!, MEL!, QRS!).

Subshrub to 50 cm high, foliage scent not recorded. Stems or lateral branches erect to straggling, red in strong light, the lower parts probably woody and up to 5 mm thick; seedling-derived stems lacking a tuberous base; upper parts with dense, antrorse, 4–6-celled non-glandular silver trichomes to 0.8 mm long but commonly much shorter, lacking glandular trichomes, with scattered 4-celled sessile glands. Leaves concolorous, green; petioles 2–3 mm long, 0.9–1.2 mm wide, with dense-velutinous, antrorse 4–8-celled non-glandular silver trichomes, lacking glandular trichomes and sessile glands; lamina narrow-ovate to obovate, 9–20 mm long, 4–8 mm wide, fleshy, serrate in upper half only with 4 or 5 indistinct teeth on each margin, lacking secondary teeth; upper surface with veins impressed but largely obscured due to dense-velutinous, antrorse, 4–8-celled non-glandular silver trichomes to 0.8 mm long, lacking glandular trichomes and

sessile glands; lower surface with veins raised but largely obscured due to dense-velutinous, antrorse, 4–8-celled non-glandular silver trichomes to 0.8 mm long, lacking glandular trichomes and sessile glands. Inflorescence cymose, comprising 1 pedunculate branch, 10–20 cm long; axis red, with sparse to dense, antrorse, 4–6-celled non-glandular trichomes to 0.4 mm long, lacking glandular trichomes, with scattered 4-celled sessile glands; bracts lanceolate-ovate, 1.0–1.2 mm long, 0.6–0.7 mm wide, early deciduous, with dense, antrorse, 4-celled non-glandular trichomes to 0.2 mm long, lacking glandular trichomes, with dense 4-celled sessile glands. Verticillasters with 4–6 flowers, 6–20 mm apart; pedicels 4–5 mm long, c. 0.2 mm diameter, with dense, antrorse, 4-celled non-glandular trichomes to 0.2 mm long, lacking glandular trichomes, with scattered 4-celled sessile glands. Calyx 2.3–2.6 mm long, with dense, antrorse, 4-celled non-glandular trichomes to 0.4 mm long, lacking glandular trichomes, with scattered 4-celled sessile glands. Corolla 10–11 mm long, blue; tube 5.9–6.2 mm long, abruptly curved at c. 90° 2.2–2.3 mm from base, slightly inflated upwards and then constricted to the slightly oblique mouth, with scattered, divaricate, 3–4-celled non-glandular trichomes to 0.2 mm long on underside, lacking glandular trichomes and sessile glands; upper lobes subcircular 1.9–2.0 mm long, 1.8–1.9 mm wide, with scattered, divaricate, 3–4-celled non-glandular trichomes to 0.2 mm long, lacking glandular trichomes, with scattered 4-celled sessile glands; lateral lobes oblong, 0.8–0.9 mm long, c. 0.7 mm wide, glabrous, lacking sessile glands; lower lobe oblong, 4.7–5.1 mm long, 4–4.5 mm wide, with scattered, divaricate, 4-celled non-glandular trichomes to 0.3 mm long, lacking glandular trichomes, with scattered sessile glands. Filaments filiform, 8–10 mm long, blue, fused to tube in bottom 3–4 mm; anthers c. 0.5 mm long and 0.3 mm wide. Style 8–10 mm long, blue. Fruiting calyx 4–4.5 mm long, all lobes with sparse, divaricate, 4-celled non-glandular trichomes to 0.3 mm long, lacking glandular trichomes, with sparse 4-celled sessile glands; upper lobe ovate, 2.4–2.5 mm long, 2–2.1 mm wide; lateral lobes lanceolate-falcate, 2.4–2.5 mm long, 1.0–1.1 mm wide; lower lobes lanceolate-falcate, 2.8–3.0 mm long, 0.5–0.6 mm wide. Seed subspherical, 0.9–1.0 mm long, 0.8–0.9 mm wide, c. 0.4 mm thick, shiny dark brown. **Fig. 1K & L.**

Specimens examined: Queensland. COOK DISTRICT: Mount Mulligan on the southern plateau of the mountain, Apr 1984, Clarkson 5310 (BRI,MBA).

Distribution and habitat: *P. minutus* is known only from Mt Mulligan northwest of Mareeba, where it occurs sporadically in open rock pavements on mesozoic sandstone in association with clumps of *Plectrachne* sp. The unrelated *P. congestus* Benth. occurs in close proximity at the base of the mountain.

Notes: The type collection is scrappy and lacks a rootstock. Further collections, especially of live material, are required for an accurate assessment of variation within the species. Nevertheless this is a most distinctive species, particularly for its short petiolate, small leaves which have teeth only in the upper portion. It is also one of the few species, the others being *P. argentatus* and *P. omissus*, with 4-celled sessile glands. *P. minutus* falls within the group of taxa grouped around *P. gratus* but is not morphologically close to either this species or the allied *P. apreptus* or *P. arenicola*. A comparison of *P. minutus* with *P. gratus* is provided in Table 2.

Table 2. Comparison of several morphological characters of *Plectranthus gratus* and *P. minutus*

| Character | <i>P. gratus</i> | <i>P. minutus</i> |
|----------------------------------|--|---|
| glandular hairs on stems | present | absent |
| leaves | long-petiolate | short-petiolate |
| leaf lamina shape | ovate to broadly ovate to broadly trullate-ovate | narrow-ovate to obovate |
| leaf lamina teeth | present along entire lamina margin | present only in upper half of lamina edge |
| leaf lamina teeth on each margin | 8 or 9 | 4 or 5 |
| sessile glands | 8-celled | 4-celled |

Conservation status: This is an uncommon plant at Mt Mulligan according to the collector J.R. Clarkson (pers. comm. 1991). An appropriate conservation coding is 2E (cf. Briggs & Leigh 1988).

Etymology: The specific epithet *minutus* alludes to the very small size of the leaves on flowering stems, as compared to those of other Australian *Plectranthus* species.

6. *Plectranthus gratus* S.T. Blake, Contrib. Queensl. Herb. 9: 49 (1971). **Type:** Queensland. COOK DISTRICT: cultivated at The Gap, Brisbane (ex plant collected at Walsh's Pyramid, Aug 1959, by R.F. Thorne), 20 January 1960, *S.T. Blake* 21192 (holo: BRI!).

Specimens examined (additional to those cited by Blake 1971): **Queensland.** COOK DISTRICT: Pete's Falls, near Mt Peter, Feb 1991, *Burke* s.n. (BRI); ditto, May 1991, *Orford* s.n. (BRI,MEL,QRS); Walsh's Pyramid, 2 km S of Gordonvale, Feb 1991, *Orford & Burke* s.n. (BRI); State Forest Reserve 700, Gillies Highway, Jun 1979, *Stocker* 1728 (QRS).

Conservation status: No conservation coding has previously been allocated to this species, despite it being known only from the type locality. Recent collections have confirmed its continued and common presence on Walsh's Pyramid and revealed other localities in the same general area. A suitable conservation coding is 2EC (cf. Briggs & Leigh 1988).

7. *Plectranthus amicum* S.T. Blake, Contrib. Queensl. Herb. 9: 26 (1971). **Type:** COOK DISTRICT: Tinaroo Range, between Tinaroo Falls and Danbulla, August 1963, *S.T. Blake* 22094 (holo: BRI!).

Specimens examined (additional to those cited by Blake 1971): **Queensland.** COOK DISTRICT: Carrington Falls, Herberton Range, May 1991, *Forster* 8367 (BRI); 20 km (by road) SE of Mareeba on Tinaroo Creek road, May 1983, *Conn* 1198 & *de Campo* (BRI,CANB). NORTH KENNEDY DISTRICT: East of Baal Gammon Mine, c. 1 km (by road) N of Herberton to Irvinebank road, c. 7 km W of Herberton, Jun 1983, *Conn & de Campo* 1281 (BRI,MBA); Along road Watsonville – Irvinebank, May 1990, *van der Werff* 1160 (QRS).

8. *Plectranthus arenicola* P. Forster, Muellera 7: 375 (1991) (as 'arenicolus'). **Type:** Queensland. COOK DISTRICT: cultivated at St Lucia, Brisbane (from material of the same collection as *P.I. Forster* 5456), 22 October 1989, *P.I. Forster* 5835 (holo: BRI; iso: K,MEL,QRS).

Specimens examined (additional to those cited by Forster 1991a): **Queensland.** COOK DISTRICT: Wasp Gully, Glennie Tableland, Jul 1991, *Tucker* s.n. (BRI,QRS); 30 km past Maloneys Springs on road to coast, Jul 1991, *Forster* 8834 (BRI).

Conservation status: As this species is now known from two localities, an updated coding is appropriately 2R (cf. Briggs & Leigh 1988).

9. *Plectranthus nitidus* P. Forster, sp. nov. affinis *P. aprepto* S.T. Blake a quo caulibus foliis racemisque trichomata apice glandulifera et glandules sessile carentibus, bracteis racemorum lanceolato-triangularibus 3.6–3.8 mm long, corollae tubo ad angulum 25–30° 1.5–1.7 mm e basi flexo differt. **Typus:** New South Wales. Cultivated at Byron Bay (ex plant collected at upper Terania Creek, Nightcap Range by P. Hardwick), 20 May 1991, *P. Hardwick* s.n. (holo: BRI!, 2 sheets + spirit; iso: K!,L!,MEL!,NSW!,QRS!).

Herb to 40 cm high, foliage scentless. Stems or lateral branches erect to straggling, the lower parts fleshy and up to 8 mm thick, seedling derived stems lacking a tuberous base; upper parts with scattered, antrorse, 2–4-celled non-glandular trichomes to 0.1 mm long, lacking glandular trichomes and sessile glands. Leaves discolorous; petioles 11–30 mm long, 1.0–1.3 mm diameter, with scattered, antrorse, non-glandular trichomes, lacking glandular trichomes and sessile glands; lamina lanceolate-ovate, 2.5–5.5 cm long, 1.5–3.5 cm wide, fleshy, serrate with 6–8 leaf teeth on each margin, occasionally with 1 or more secondary teeth; upper surface green, veins impressed, glabrous, lacking sessile glands; lower surface purple, veins raised, with scattered, antrorse, 2–4-celled non-glandular trichomes to 0.1 mm long, lacking glandular trichomes, with very scattered 8-celled sessile glands. Inflorescence cymose, 20–40 cm long, comprising 1–3(5) pedunculate branches; each branch 15–35 cm long; axis with scattered, antrorse, 2–4-celled non-glandular trichomes to 0.1 mm long, lacking glandular trichomes and sessile glands;

bracts lanceolate-triangular, 3.6–3.8 mm long, 2.5–2.6 mm wide, glabrous, ciliate, lacking sessile glands. Verticillasters 6–10-flowered, 6–19 mm apart; pedicels 4.0–6.3 mm long, c. 0.2 mm diameter, glabrous or with scattered, divaricate, 2-celled non-glandular trichomes to 0.1 mm long, lacking sessile glands. Calyx 2.5–2.7 mm long, with scattered, divaricate, 2-celled non-glandular trichomes to 0.1 mm long, lacking glandular trichomes, with scattered 8-celled sessile glands. Corolla 8–9 mm long, lilac-white; tube 3.8–4.4 mm long, abruptly curved at 25–30° 1.5–1.7 mm from base, slightly inflated upwards, glabrous, lacking sessile glands; upper lobes subcircular, 2.2–2.5 mm long, 2.0–2.2 mm wide, glabrous or with very scattered, divaricate, 2-celled non-glandular trichomes to 0.1 mm long, lacking sessile glands; lateral lobes oblong, 1.5–1.8 mm long, 0.8–1.0 mm wide, glabrous, lacking sessile glands; lower lobe oblong, 3.5–3.9 mm long, 2.3–3.1 mm wide, glabrous, lacking sessile glands. Filaments filiform, 7–9 mm long, lilac-white, fused for 3–4 mm in bottom of tube; anthers 0.5–0.6 mm long and 0.2 mm wide. Style 7–9 mm long, lilac-white. Fruiting calyx 3.6–3.8 mm long; upper lobe ovate, 1.8–2.8 mm long, 1.3–2.6 mm wide, glabrous, lacking sessile glands; lateral lobes lanceolate-falcate, 1.5–2.2 mm long, 0.7–0.9 mm wide, glabrous or with very scattered, divaricate, 2-celled non-glandular trichomes to 0.1 mm long, lacking glandular trichomes, lacking or with very scattered 8-celled sessile glands; lower lobes lanceolate-falcate, 2.2–3.1 mm long, 0.6–0.8 mm wide, glabrous or with very scattered, divaricate, 2-celled non-glandular trichomes to 0.1 mm long and either lacking or with very scattered 8-celled sessile glands. Seed semi-spherical, shiny black, 0.9–1 mm long, 0.5–0.8 wide, 0.3–0.4 mm thick. **Fig. 1E & F.**

Specimens examined: QUEENSLAND. MORETON DISTRICT: Mudgeeraba to Springbrook road, Feb 1991, *Forster* 7800 & *Leiper* (BRI). NEW SOUTH WALES. Terania Creek, 10 km NNE of The Shannon, Feb 1988, [*Hardwick* s.n.] *Coveny* 10625 (BRI); cultivated at Rainworth (ex plant collected at Terania Creek upper catchment, Nightcap Range by P. Hardwick in 1986), Mar 1991, *Forster* 7812 (BRI).

Distribution and habitat: Known only from two localities in the border ranges in Queensland and adjacent parts of New South Wales. Plants occur on rock outcrops either in rainforest or in open forest in close proximity to the rainforest margin.

Notes: This is a remarkable species in that it is the only Australian species that may occur totally under the rainforest canopy. It is closely allied to *P. apreptus* S.T. Blake from north Queensland and is probably the species referred to as such by Harden (1984) under that name. *P. nitidus* differs from *P. apreptus* in its stems, leaves and racemes lacking glandular trichomes and nearly always lacking sessile glands; the axis bracts lanceolate-triangular and 3.6–3.8 mm long; and the corolla tube bent at 25–30°, 1.5–1.7 mm from the base. There is some minor variation between the Springbrook and Terania Creek populations, the former being less woody, having consistently thinner leaves with purple colouring and less pronounced venation below, virtually no sessile glands and unbranched inflorescences. As the two populations are similar, it can be expected that when further populations are found they will contain intermediates. For these reasons, this variation is not considered worthy of formal taxonomic recognition at this time.

Conservation status: Further survey work is required both in and near to rainforest communities in the border ranges and northern New South Wales to ascertain the precise range of this species. A relevant conservation coding at this stage is 2EC (cf. Briggs & Leigh 1988).

Etymology: The specific epithet *nitidus* alludes to the shiny appearance of the foliage.

10. *Plectranthus amboinicus* (Lour.) Sprengel, Syst. Veg. 2: 690 (1825) (as 'amboinensis'); *Coleus amboinicus* Lour., Fl. Coch. 372 (1790). Type: India. Patna, *Buchanan-Hamilton* (holo: K-W, fiche at BRI).

Launert, Mitt. Bot. Munchen 7: 298 (1968); Codd, Bothalia 11: 388–389 (1975).

Specimen examined: MORETON DISTRICT: Esplanade, Brisbane River bank, St Lucia, Sep 1986, *Forster* 2611 (BRI).

Distribution and habitat: *P. amboinicus* is native to the Indian subcontinent and has become naturalised in a number of localities in suburban Brisbane where garden rubbish has been dumped. It is widely cultivated both as a decorative ornamental and for its culinary use as "Five Spice".

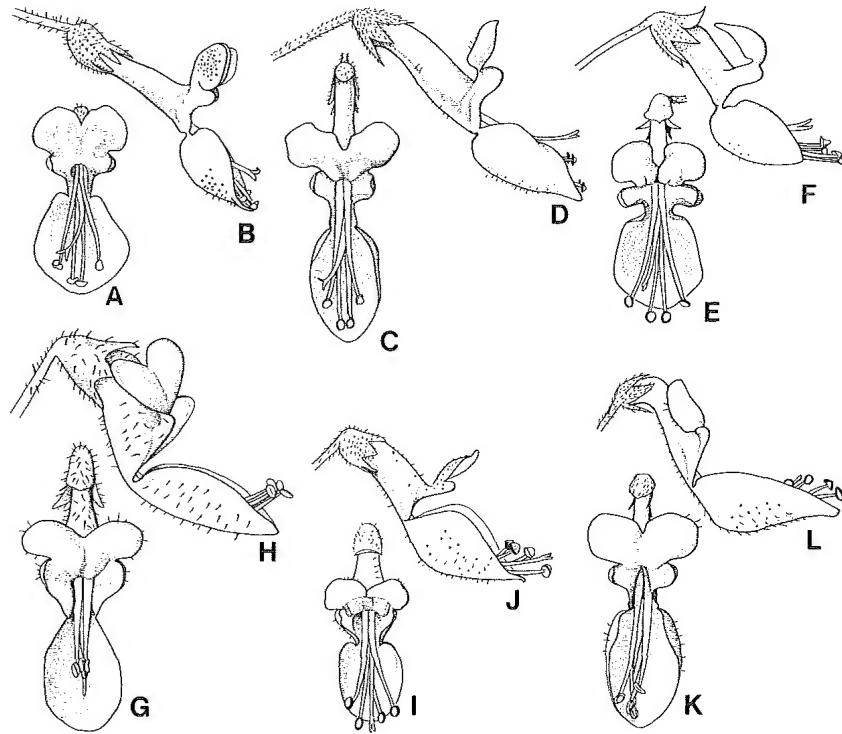


Fig. 1. Flowers of *Plectranthus* species: A,C,E,G,I,K. face view of flowers $\times 4$. B,D,F,H,J,L. side view of flowers $\times 4$. A,B, *P. argentatus* (Forster 1923); C,D, *P. torrenticola* (Forster 7795); E,F, *P. nitidus* (Forster 7812); G,H, *P. graniticola* (Forster 8056 & McDonald); I,J, *P. omissus* (Forster 4977); K,L, *P. minutus* (Clarkson 5902).

Notes: A good descriptive account and taxonomic bibliography for this species may be found in Codd (1975).

Key to species of *Plectranthus* in Queensland

Notes: This key works best with fresh material and is partially adapted from that of Blake (1971). Hybrids are not accounted for.

- | | |
|---|----|
| 1. Stems, branches, floral axes and the lower surface of the leaves with divaricate to retrorse, non-glandular trichomes | 2 |
| Stems, branches, floral axes and the lower surface of the leaves with antrorse, non-glandular trichomes | 14 |
| 2. Leaf lamina with 9–34 teeth on each margin | 3 |
| Leaf lamina with 4–10 teeth on each margin | 13 |
| 3. Stems and lower leaf surfaces with dense glandular trichomes | 4 |
| Stems and lower leaf surfaces lacking or with only scattered glandular trichomes | 8 |
| 4. Fruiting calyx divided to about the middle; lateral lobes 1.5–2.0 times as long as wide; lower lobes 2.5–4.0 times as long as wide | 5 |
| Fruiting calyx divided to the middle or beyond; lateral lobes 2.5–4.0 times as long as wide; lower lobes 4–5 times as long as wide | 7 |

5. Calyx in flower 2.3–3.3 mm long; upper lobe of fruiting calyx nearly as wide, but usually much narrower than long, longer than lateral lobes **P. diversus**
 Calyx in flower 1.6–2.3 mm long; upper lobe of fruiting calyx as wide, but usually wider than long, not longer than lateral lobes 6
6. Trichomes silver, flowers in verticillaster 10–12, corolla 9.8–12.2 mm long **P. torrenticola**
 Trichomes clear, flowers in verticillaster 12–15, corolla 7.8–9 mm long **P. graveolens**
7. Stems and leaves lacking sessile glands; leaf teeth pairs 7–15; racemes sparsely flowered **P. mirus**
 Stems and leaves with sessile glands; leaf teeth pairs 12–34; racemes densely flowered **P. foetidus**
8. Stems and leaves lacking sessile glands **P. amboinicus**
 Stems and leaves with sessile glands 9
9. Leaf lamina 2.0–2.5 times as long as wide; petiole 0.1–0.2 times as long as lamina **P. alloplectus**
 Leaf lamina 1–2 times as long as wide; petiole 0.2–0.5 times as long as lamina 10
10. Sessile glands 4-celled 11
 Sessile glands 8-celled 12
11. Verticillasters 14–16-flowered **P. graniticola**
 Verticillasters 6–10-flowered **P. argentatus**
12. Leaf lamina with 7–12 teeth on each margin, verticillasters 10-flowered **P. amicorum**
 Leaf lamina with 12–28 teeth on each margin, verticillasters 14–16-flowered **P. omissus**
13. Stems lacking a tuberous base; inflorescence axis lacking or with only scattered sessile glands **P. suaveolens**
 Stems with a tuberous base; inflorescence axis with dense sessile glands **P. parviflorus**
14. Leaf lamina serrate in upper half only **P. minutus**
 Leaf lamina serrate for entire length 15
15. Subshrubs to 60 cm high; inflorescence cymose, with 1–5 branches; verticillasters 8–15 mm apart 16
 Shrubs 1–2 m high; inflorescence \pm paniculate with up to 11 branches; verticillasters 2–10 mm apart 20
16. Leaf lamina with 3–6 teeth on each margin **P. arenicola**
 Leaf lamina with 7–23 teeth on each margin 17
17. Leaf trichomes drying yellow, corolla 13–16 mm long **P. blakei**
 Leaf trichomes drying clear, corolla 7–12 mm long 18
18. Stems with sessile glands; upper leaf surface matt; verticillasters 10–20-flowered **P. gratus**
 Stems lacking sessile glands; upper leaf surface glossy; verticillasters 6–10-flowered 19

19. Stems, leaves and racemes lacking glandular trichomes; axis bracts lanceolate-triangular, 3.7–3.8 mm long; corolla tube bent at c. 30° **P. nitidus**
 Stems, leaves and racemes with scattered glandular trichomes; axis bracts ovate, 1.2–1.8 mm long; corolla tube bent at 90–120° **P. apreptus**
20. Calyx 1.8–2.7 mm long in flower, 3.5–4.5 mm long in fruit; verticillasters 12–20-flowered **P. spectabilis**
 Calyx 1–1.6 mm long in flower, 2–3.2 mm long in fruit; verticillasters 20–50-flowered **P. congestus**

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NOTES ON AUSTRALIAN COREOPSIDINAE (COMPOSITAE)

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Summary

The only published description of *Glossogyne orthochaeta* F. Muell. (Compositae) is based on fruiting material; a more complete one is given here. The species is transferred to *Glossocardia* Cass. and the new combination *Glossocardia orthochaeta* (F. Muell.) Veldk. is made for it. A key to it and related species is added. Additional collections of some rare species have been found and are noted.

Introduction

Since the publication of Veldkamp and Kreffer (1991) on the South-east Asian and Australian Coreopsidinae, the senior author has had the opportunity to visit some Australian herbaria (CANB, CBG, NSW) to examine additional material, through grants from the Australian National University, Canberra, and the Dutch Scientific Research Organization 'Nederlands Wetenschappelijk Onderzoek', which are hereby gratefully acknowledged.

This group of taxa is especially interesting for the presence of a Kranz anatomy. Notable also is the change in colour of water when leaves or capitula are boiled in it: it turns golden, red, or purple, and the leafblades and capitula of the same plant do not necessarily produce the same colour. Some kind of oil seems present. Collectors have also noted the presence of fragrance in stem, leaves, and capitula ('flowers').

The identity of *Glossogyne orthochaeta* F. Muell. was established by the examination of an additional collection found in NSW and inspection of the holotype of the combination from MEL, kindly sent on loan by Dr. J.H. Ross. It turned out to be a species of *Glossocardia*, apparently very rare although with its large yellow capitula and radiate habit most likely a conspicuous plant in the field.

Brief diagnostic descriptions are given below for the other species of this subtribe; more extensive ones with more literature references and notes can be found in Veldkamp and Kreffer (1991).

Key to Australian Taxa of Coreopsidinae

1. Cauline leaves alternate, sometimes closely imbricate, pinnatifid to pinnatisect; capitula radiate; disc florets 4-merous; achenes lanceolate in outline, dark brown to black, ribbed, not winged 2
 - Cauline leaves opposite, simple; capitula discoid; disc florets 5-merous; achenes obovoid in outline, concave, yellowish brown, broadly winged, not ribbed 1. *Diodontium filifolium*
2. Ray florets 3-lobulate; achenes with longitudinal ribs only; awns 2 3
 - Ray florets 2-lobulate; achenes also with many warty, transverse ridges; awns 3 or 4 5. *Trioncinia retroflexa*
3. Achenes more or less straight, awns usually straight 4
 - Achenes adaxially strongly involute, awns strongly reflexed 4. *Glossocardia refracta*
4. Leaves mainly basal; capitula 5-8 mm diameter; involucre bracts straight; ray florets 5-12, rays up to 5 mm long 2. *Glossocardia bidens*
 - Cauline leaves numerous (basal ones unknown), close-set, densely imbricate; capitula c. 50 mm diameter; involucre bracts transversally folded, reflexed against the peduncle in fruit; ray florets c. 17, c. 15 mm long 3. *Glossocardia orthochaeta*

1. *Diodontium filifolium* F. Muell. in Hooker's J. Bot. Kew Gard. Misc. 9: 19 (1857); *Glossogyne filifolia* (F. Muell.) F. Muell. ex Benth., Fl. austral. 3: 544 (1866). **Type:** Australia, Northern Territory, sources of Hooker's Creek, between Sturt Creek and Victoria River, *F. v. Mueller* s.n. (holo, MEL; iso: K).

Base not seen. Cauline leaves opposite and close-set at the base of the branches. Blades simple, linear, up to 8 cm × 0.75 mm. Capitula discoid, up to 7 mm diameter. Involucral bracts straight. Disc florets 3–10, 5-merous. Achenes obovoid in outline, broadly winged when mature, concave, smooth, not ribbed, yellowish brown; awns 2, straight.

Additional collections examined: Northern Territory, 9 km SE of Mountain Valley H.S., c. 14°S, 134°E, Nelson 219 (NSW); 17 miles N of Helen Springs Station, Perry 1921 (CANB, NT).

Distribution and habitat: Australia. Northern Territory. Grows on granite hills, sandstone tableland, grassy flats near watercourses.

Collector's notes: Bush, strongly smelling, flowers white or yellow. Achenes shiny with yellow wings.

2. *Glossocardia bidens* (Retz.) Veldk., Blumea 35: 468 (1991); *Zinnia bidens* Retz., Observ. bot. 5: 28 (1788); *Glossogyne pinnatifida* DC. ex Wight, Contr. bot. India: 19 (1834), nom. superfl.; *Glossogyne bidens* (Retz.) Alston in Trimen, Handb. fl. Ceylon 6, Suppl.: 168 (1931); *Neuractis bidens* (Retz.) Veldk. ex Tadesse, Kew Bull. 45: 144 (1990). **Type:** India, Bengal, Koenig s.n. (holo: LD).

Bidens tenuifolia Labill., Sert. austro-caled.: 44, fig. 45 (1825); *Glossogyne tenuifolia* (Labill.) Cass. ex Less., Syn. gen. Compos.: 212 (1832); **Type:** New Caledonia, Labillardiere s.n. (holo: FI; iso: P).

Coreopsis tannensis Forst. ex Sprengel, Syst. Veg. 3: 614 (1826); *Glossogyne tannensis* (Forst. ex Sprengel) Garnock-Jones, Taxon 35: 125 (1986). **Type:** New Hebrides, Tana Is., Forster s.n. (hololecto: K; iso: BM).

Glossogyne pedunculosa DC., Prodr. 5: 632 (1836). **Type:** Australia, Queensland, Cape Cleveland, Cunningham s.n. (holo: G).

Glossogyne bidentidea F. Muell., Linnaea 25: 402 (1852). **Type:** South Australia, Spencer Gulf, in sterile somewhat saline areas, 'spring', *F. v. Mueller* s.n. (holo: MEL).

Leaves mainly basal, alternate, also tufted at the nodes under lateral branches; cauline blades (bi-)pinnatifid, deltoid in outline, 1–4 cm × 5–30 mm. Capitula radiate, 5–8 mm diameter. Involucral bracts straight. Ray florets 5–12, rays up to 5 mm long, 3-lobulate. Disc florets 7–12, 4-merous. Achenes more or less straight, lanceolate in outline, dark brown to black, slightly ribbed, not winged; awns 2, usually more or less erect, sometimes patent, rarely reflexed.

Distribution and habitat: Tanzania, India to Korea, Malasia, Australia (Northern Territory, Queensland, New South Wales, Victoria, South Australia), New Caledonia, and Pacific Islands of the Carolines, Fiji, Marianas (Guam, Pagan and Rota). Grows on roadsides; dry slopes in (burnt) grasslands; open savannah; open eucalypt forest; coconut plantations; rocky soil, on limestone crevices, on lava, in clay; apparently mainly along the coast but inland up to 450 (rarely to 1160) m altitude.

Collector's notes: Aromatic. Fleshy taproot. Semidecumbent. Leaves greyish green, bright green above, silvery green below. Stems wiry. Flowers fragrant. Ray florets (bright) yellow, golden, orange, or red. Disc florets brown. Young fruits chocolate brown.

Uses: In India a preparation of the root is used against bites of snakes, stings of scorpions, and toothaches.

3. *Glossocardia orthochaeta* (F. Muell.) Veldk., **comb. nov.**

Glossogyne orthochaeta F. Muell., Victoria Naturalist 8: 116 (1891); Bot. Centralbl. 48: 363 (1891). **Type:** Australia, Queensland. COOK DISTRICT: near the South Coen River, A° 1891, Stephen Johnson s.n. (holo: MEL).

Probably perennial; roots not seen. Branches said to be radiating, at least the flowering ones erect; branching sympodially. Cauline leaves alternate, close-set, densely imbricate,

ascending, sparsely septate-glandular puberulous, pinnate, the ones on the scape distant, simple. Petioles indistinct from the blade, 2–6.5 cm to the first lobe; cauline blades 4.5–6 × 1.5–2 cm, 3–5-pinnatilobed with lobes ascending, linear, sometimes with a small secondary lobe, up to 4.5 cm × 1.2 mm, stiffly herbaceous, 1-nerved; Kranz anatomy indistinct. Capitula solitary on a long, up to 41.5 cm long stalk, radiate, c. 50 mm diameter (when dry). Phyllaries c. 5, resembling the upper scapose leaves, linear-lanceolate, up to 8.0 × 1.5 mm with margins scarious, septate-hairy, gradually acute. Involucral bracts 8–12, more or less in 1 row, ovate-lanceolate, folded back in the middle at anthesis, reflexed against and appressed to the stalk in fruit (still medially folded!), c. 10.0 × 2.5 mm, margins scarious, slightly fimbriately puberulous, and narrowed to the truncate, erose apex, the surfaces striate with minute sparsely set, shortly stalked, capitate glandular hairs on both surfaces, glabrous in fruit. Receptacular bracts decreasing in size inward, ovate-lanceolate (the outer) to oblanceolate, the inner, these c. 7.5 × 1.2 mm. Ray florets female, up to 17, rays c. 15 × 2 mm, 3-lobulate, yellowish (when dry), with 9 purplish nerves, these often covered by small resinous droplets. Disk florets bisexual, fertile, numerous, 4-merous, c. 5 mm long, yellowish (when dry). Achenes homomorph, more or less straight, the apex slightly curving outwards, lanceolate in outline, c. 5.5 × 0.75–1.0 mm, shiny black, ribbed on both sides; awns 2, erect, c. 1 mm long, yellow, hamate, with a small tubercle in between the awns.

Additional collection examined: Queensland. COOK DISTRICT: Stannary Hills, 17°19'S, 145°13'E, *Gittins* 528 (NSW, L, fragm.).

Distribution and habitat: Australia. Queensland. Cook District. The habitat is not indicated.

Collector's notes: Tufted plant, the foliage of the numerous radiating stems forming a hemispherical mass on the ground.

Notes: The leaves when boiled exude a reddish fluid, the capitula a yellowish one.

4. *Glossocardia refracta* Veldk., *Blumea* 35: 476 (1991). **Type:** Australia, Queensland. COOK DISTRICT: near Granite Creek, c. 12 miles [19.2 km] SSW of Mareeba, 23 April 1967, *Pedley* 2282 (holo: K; iso: BRI, L).

Leaves mainly basal, alternate; blades (bi-)pinnatisect, trullate, up to 4 cm × 30 mm. Capitula radiate, up to 10 mm diameter. Involucral bracts straight. Ray florets c. 5, rays c. 2 mm long, 3-lobulate. Disc florets 10–16, 4-merous. Achenes adaxially strongly involute, lanceolate in outline, black, ribbed, not winged; awns 2, strongly reflexed.

Additional collections examined: Queensland. COOK DISTRICT: 8 km NE of Petford on the road to Dimbulah, Jan. 1982, *Clarkson* 4246-B (NSW, BRI); Davies Creek, Mareeba, Apr. 1962, *McKee* 9368 (NSW).

Distribution and habitat: Australia. Queensland. Cook District. Grows in low hilly area with *Eucalyptus melanophloia*-*Petalostigma banksii* woodland on shallow stony soil with rocky outcrops; c. 400 m altitude.

Collector's notes: Perennial erect herb. Flowers yellow. Rays yellow. Fruits dark brown.

5. *Trioncinia retroflexa* (F. Muell.) Veldk., *Blumea* 35: 481 (1991); *Glossogyne retroflexa* F. Muell., *Fragm.* 1: 51 (1858). **Type:** Australia, Queensland, Peak Downs, *F. v. Mueller* s.n. (holo: MEL; iso: K).

Leaves mainly basal, alternate, blades (bi-)pinnatifid, trullate in outline, up to 3.5 × 2.0 cm. Capitula radiate, up to 7 mm diameter. Involucral bracts straight. Ray florets at least 5, c. 3.25 mm long, 2-lobulate. Disc florets 10 or more, 4-merous. Achenes adaxially slightly curved inward, lanceolate in outline, dark brown to black, ribbed, with many warty transverse ridges, not winged; awns 3 or 4, strongly reflexed.

Distribution and habitat: Australia. Queensland. 'Peak Downs'; only known from the type (see note). Grows on 'Basaltic plains'.

Note. The unknown referee of this paper noted that there is an *S.T. Blake* collection (AQ 414345) of this species in BRI from black soil at Blair Athol (16 March 1935), 22°4'S, 147°3'E.

Reference

VELDKAMP, J.F. & KREFFER, L.A. (1991). Notes on Southeast Asian and Australian Coreopsidinae (Asteraceae). *Blumea* 35: 459–482.

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ACACIA PEDLEYI (FABACEAE, MIMOSOIDEAE), A NEW SPECIES FROM CENTRAL-EASTERN QUEENSLAND

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Summary

Acacia pedleyi, a new member of *Acacia* sect. *Botrycephalae*, is described and illustrated with notes on distribution, habitat and alliances. This species has a restricted distribution in the Biloela area in central-eastern Queensland.

Introduction

A new bipinnate *Acacia* species from Queensland is described, to enable its inclusion in the forthcoming volume on *Acacia* in the 'Flora of Australia'.

Acacia pedleyi Tind. et Kodela, **sp. nov.** ab *Acacia storyi* Tind. atque *A. olsenii* Tind. differt: ramulis non pruinosis, brunneis vel viridibrunneis, puberulis, non glabris ut *A. olsenii* et *A. storyi*, petiolis rhachidibusque puberulis, pinnis 3–8-jugis, pinnularum apicibus rotundatioribus, pedunculis puberulis, ovaris pilis albis pubescentibus, leguminibus 5–9 mm latis et sparse puberulis; ab *A. olsenii* in capitulo 14–20 floribus luteolis non 7–12 floribus luteis distinguitur; ab *A. storyi* calycibus 0.4–0.5 mm longis non 0.6–0.7 mm longis distinguitur. **Typus:** Queensland, PORT CURTIS DISTRICT: c. 20 km NNE of Biloela on western slopes of Calliope Range, 29 November 1989, *L. Pedley* 5488 (holo: BRI; iso: AD,B,CANB,CBG,K,L,MEL,MO,NSW,PERTH,US).

Slender erect tree to 10 m high; bark smooth (sometimes lower part of bole rough), grey at base, greenish above. Branchlets \pm terete but angled towards their apices, brown to greenish brown, puberulous with appressed, white, hyaline or pale yellow hairs to c. 0.2 mm long, with minutely tuberculate, longitudinal ridges to 0.3 mm high. Young tips of leaves clothed with a dense indumentum of pale yellow to golden, silky hairs in addition to reddish brown, glandular hairs. Leaves bipinnate, dark green, feathery; pulvinus 1.8–3.5 mm long; petiole 1–2 cm long, slightly flattened in the dorso-ventral plane, clothed with hairs similar to those on branchlets, the adaxial surface with a puberulous ridge bearing a conspicuous gland near the base of the lowest pair of pinnae, the gland broad-elliptical to broad-oblong or sometimes circular in outline, green and puberulous at base, 1.0–1.5 mm long, 0.7–1.0 mm wide, the broad rim brown to tan and usually glabrous, the orifice depressed, 0.3–0.5 mm long, 0.25–0.35 mm wide; rhachis 3.0–5.8 cm long, clothed with \pm appressed hairs to 0.2 mm long, the adaxial puberulous ridge bearing a gland at the base of each pair of pinnae and also 1–3 similar (but often smaller) interjugary, brown-rimmed glands between successive pairs of pinnae, the glands similar to the petiolar gland, 0.6–1.3 mm long, 0.4–1.1 mm wide, with a circular to elliptical orifice 0.2–0.4(–0.6) mm long, (0.1–)0.2–0.4 mm wide; pinnae (3–)5–8 pairs, 2.1–7.0 cm long, 3.5–6.5 mm wide; secondary rhachis clothed with short, appressed, yellowish hairs mainly on the abaxial surface; pinnules 20–104 pairs, oblong to cultrate (sometimes almost linear), 0.8–3.6 mm long, (0.3–)0.4–0.5(–0.7) mm wide, often overlapping, glabrous or white-ciliate, apex obtuse. Capitula of 14–20 flowers, globular, (3–)4–5 mm diameter, pale yellow, borne in racemes or panicles; peduncles 1.5–4.0 mm long, puberulous; bract at base of peduncles broadly deltate, ciliate; bracteoles 0.45–0.6 mm long, sagittiform with the linear claw expanded into a \pm deltoid lamina which is basally or sometimes centrally attached, ciliate. Flowers 5-merous; calyx 0.4–0.5 mm long, dissected by 1/3–1/2 or sometimes to the base, with minute, stiff, white or brownish hairs on the outer surface mainly on the midribs and sepal apices; sepals broadly deltate to \pm spatulate; corolla 1.0–1.2 mm long, dissected by c. 1/2; petals narrow-oblongate or narrow-elliptical, 1-nerved; ovary pubescent with white hairs. Legumes linear, 4–13 cm long, 5–9 mm wide, \pm straight-sided or constricted between seeds, straight or very slightly curved, flat except convex over seeds, thinly coriaceous, surface with minor transverse nerves, sparsely clothed with appressed white hairs to 0.3 mm long, dull brownish black,

the somewhat prominent margins brown. Seeds 4–13 longitudinal in legumes, slightly compressed, oblongoid to broadly oblongoid or ellipsoid to broadly ellipsoid, 4.4–6.1 mm long, 2.6–3.2 mm wide, black; pleurogram open and constricted towards the hilum, \pm “U”-shaped; areole same colour as the rest of the seed, sometimes slightly raised, 2.9–4.1 mm long, 1.3–1.6 mm wide; funicle cream-coloured to fawn, filiform at first then expanded into a cap-like aril, folded 1 or 2 times beneath the seed. **Fig. 1.**

Specimens examined: Queensland. PORT CURTIS DISTRICT: T.R. 170, Thalberg, c. 30 km north-east of Biloela, 24°14'S, 150°39'E, Oct 1987, *Shepard* A33 (BRI); Callide Range, 22 km from Biloela, towards Gladstone, 24°14'S, 150°34'E, Nov 1988, *Bean* 978 (BRI); 15 km NE of Biloela, 24°2'-S, 150°3'-E, May 1987, *Ford* s.n. (BRI, 2 sheets).

Distribution and habitat: So far, *A. pedleyi* is only known from the Biloela area in the Port Curtis District, central-eastern Queensland. It occurs in understorey, sometimes with *Acacia crassa*, in open forest with *Eucalyptus citriodora*, *E. moluccana*, *E. crebra* and/or *E. maculata* or in poplar box (*Eucalyptus populnea*) woodland; recorded from slopes and tops of ridges on red loamy soil.

Phenology: Flowering from November to December. Fruiting May and October. As *A. pedleyi* sometimes fruits in October, this suggests that it may also flower from April to May.

Conservation status: *A. pedleyi* is probably rare but neither of the authors have seen this species in the field.

Etymology: the specific epithet honours Mr Leslie Pedley, formerly of the Queensland Herbarium, for his outstanding contribution to *Acacia* taxonomy and other botanical research.

Notes: *Acacia pedleyi* is a member of *Acacia* sect. *Botrycephalae*, a group of species occurring in the eastern Australian States from central-eastern Queensland to Tasmania and in South Australia. The new species is allied to *Acacia storyi* Tind. (which is confined to the Blackdown Tableland and lower country on its western side, in the Leichhardt District, Queensland) and *Acacia olsenii* Tind. (which occurs on the Southern Tablelands, New South Wales). *A. pedleyi*, *A. storyi* and *A. deanei* (R. Baker) Welch, Coombs & McGlynn subsp. *deanei* are the most northerly occurring species in the sect. *Botrycephalae*. *A. pedleyi* is more hairy than the other two species and the apices of the pinnules are more rounded than *A. storyi* (Tindale 1980) and *A. olsenii* (Tindale 1966). The latter two species, particularly *A. olsenii*, also often have glaucous branchlets and legumes. The legumes are sparsely puberulous in *A. pedleyi* but glabrous in the other two species. *A. pedleyi* occurs closer to the coast than the other two species and flowers in November and December, as well as possibly in April–May, whereas *A. storyi* and *A. olsenii* flower in April–August.

In Maslin and Pedley (1982) distribution maps are provided for *A. olsenii* (p. 87) and *A. storyi* (p. 113). For the distribution of *A. pedleyi* the Monto sheet (SG 56-1, edition 2) in the Australia 1: 250 000 topographic series should be consulted.

Key to distinguish *Acacia pedleyi* from its closest allies

1. Branchlets brown to greenish brown, non-glaucous, puberulous; young tips of leaves predominantly pale yellow or golden, densely clothed on both surfaces with silky hairs and reddish brown, glandular hairs; leaves with 3–8 pairs of pinnae; petioles and rachises densely clothed with white or yellowish, mostly single, appressed or subappressed hairs and reddish brown glandular hairs; peduncles puberulous; ovary pubescent with white hairs; flowers 14–20 per head; legumes 5–9 mm wide, sparsely puberulous. ***A. pedleyi***
- Branchlets bluish black, bluish dark brown or purplish, often glaucous, glabrous or almost so; young tips of leaves brownish green with white, yellow or golden-brown, silky, often clustered hairs and reddish brown, glandular hairs on the adaxial surface; leaves with 8–18 pairs of pinnae; petioles and rachises glabrous or with very sparse, minute, stiff, single or clustered hairs; peduncles glabrous; ovary glabrous; legumes 5–12 mm wide, glabrous 2

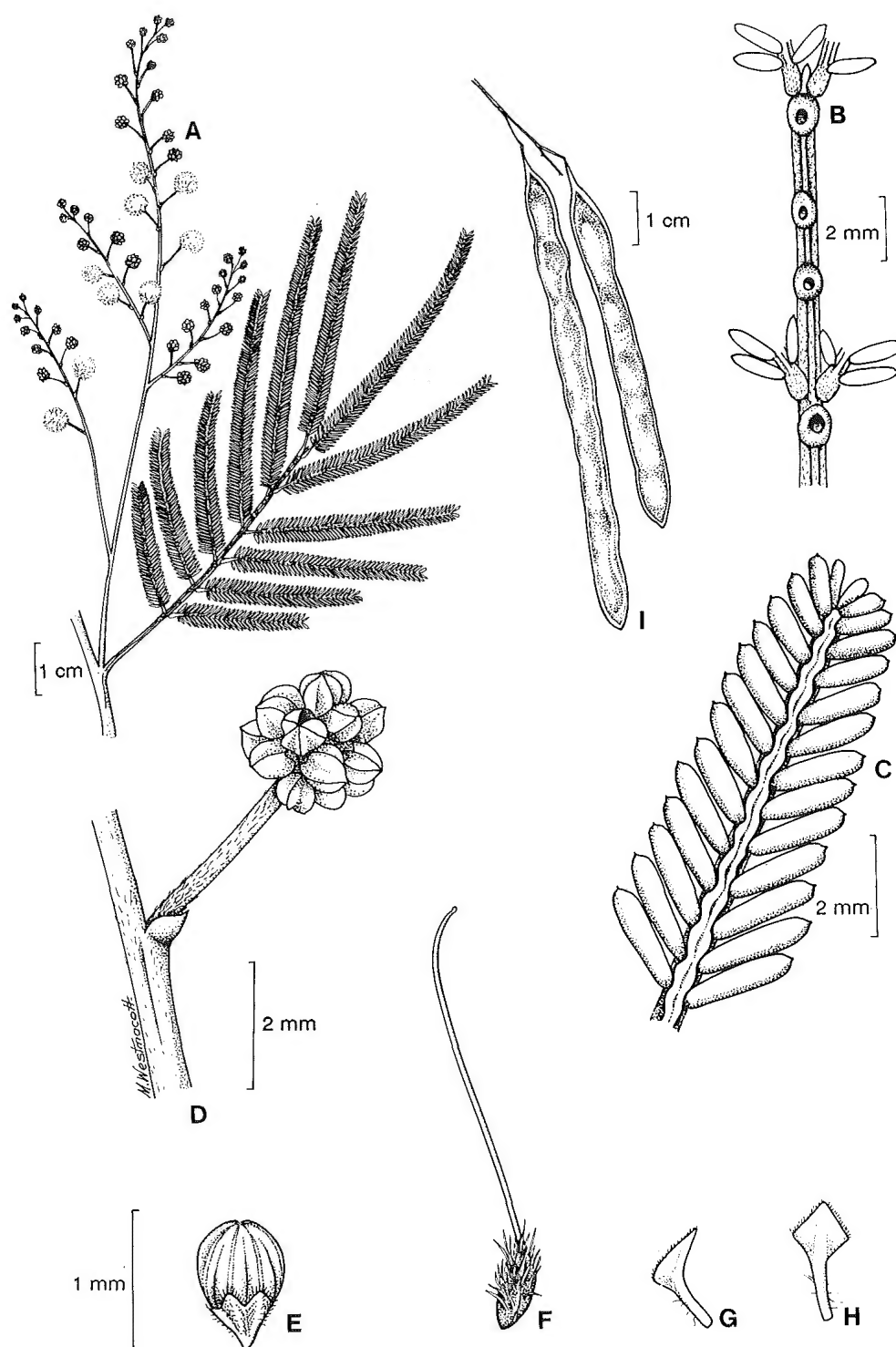


Fig 1. *Acacia pedleyi*: A. habit study; B. detail of main rhachis with glands. C. pinnules. D. capitulum in bud. E. young flower. F. gynoeceium. G, H. bracteoles. I. legumes. A-H, Pedley 5488; I, Bean 978.

2. Pinnules in 32–61 pairs; flowers 14–20 per head, pale yellow; calyx (0.5–)0.7–0.85 mm long; corolla c. twice the length of the calyx . . . **A. storyi**
Pinnules in 52–106 pairs; flowers 7–12 per head, deep yellow; calyx 0.3–0.5(–0.7) mm long; corolla c. 2.5–3.0 times the length of the calyx **A. olsenii**

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CHROMOSOME NUMBERS OF AUSTRALIAN SPECIES OF *IPOMOEA* L. (CONVOLVULACEAE)

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Summary

Somatic chromosome counts are reported on 23 species of *Ipomoea* L. found in Australia. The majority are diploids of the basic number $x = 15$ ($2n = 30$), but three exhibit tetraploidy ($2n = 60$), namely *I. plebeia* R. Br., *I. lonchophylla* J. Black and *I. racemigera* F. Muell. These results are discussed in comparison with the cytology of other *Ipomoea* species in the world, endemism of Australian species and the possibility of parallel but limited polyploidy as one product of geographically separate evolution in the genus.

Introduction

In the 'Chromosome Atlas of Flowering Plants', Darling and Wylie (1955, p. 308) confidently assigned the basic number of 15 to the genus *Ipomoea* L., with the majority of species having a somatic number of 30. Diploids were recorded in both Old and New World species, but two American species, shown to have $2n$ numbers of 60 (*I. ramouris*, properly *I. ramosa*) and 90 (*I. batatas*, the cultivated sweet potato), suggested a polyploid series in the genus. Subsequent cytological studies in American species confirmed both the basic chromosome number and the incidence of polyploidy in *Ipomoea* (Ting *et al.* 1957; Nishiyama *et al.* 1964; Nishiyama & Teramura 1962). Jones (1964, 1968) enlarged the geographic representation of species by reporting chromosome counts for species from Egypt, Iran, India and China, without extending the known polyploidy in *Ipomoea* beyond American species, of which a further two wild representatives *I. tiliacea* (Willd.) Choisy and *I. arborescens* (Kunth) G. Don are shown to be tetraploids. As Jones (1968) explained, the inconsistency of reports of earlier chromosome counts of these two species may have been due to misidentification of unfamiliar plants, although the possibility of autopolyploidy remains. However, questionable identification has plagued cytological work in the genus in the past, which brings Australian species into consideration.

I. gracilis R. Br. is an endemic of Australia (Bentham 1869; Austin 1978), yet it is cited in the literature as a tetraploid based on collections from Cuba (Ting *et al.* 1957) and Mexico (Nishiyama *et al.* 1961). Taxonomic confusion may have resulted from the assignment of synonyms, *I. fastigiata* Sweet and *I. denticulata* Choisy, by Ting, Nishiyama and their respective co-authors. According to the revision of van Ooststroom (1954), *I. denticulata* is synonymous with *I. gracilis*, though Bentham (1869) kept the relevant taxa separate in Australia. Johnson (pers. comm.) suggests that *I. tiliacea*, collected as a single specimen in Australia by L.J. Brass from the Daintree River region in 1932, may be *I. fastigiata*. Austin (1991) has at least clarified the situation with regard to earlier Old World recordings of '*I. gracilis*'; his taxonomic analysis indicates that the proper identification for these non-Australian plants is *I. littoralis*.

In more general terms, interest in Australian *Ipomoea* has quickened with the discovery of 'new' endemic species, and the realization that the ethnohistoric records of 'bush potato' of the arid zone, supported by the contemporary observations of anthropologists (Meggitt 1957; O'Connell *et al.* 1983), indicated important food sources of the prehistoric Aborigine. Golson's comprehensive survey (1971) of Aboriginal food plants included *Ipomoea* species, many of which are reported on in this paper. Indeed the present account of the first cytological survey of the genus in Australia arose from two Australian National University seminars in 1984 and 1986, when biologists and anthropologists came together under the rather enigmatic theme, 'Australia as bystander in the development of Pacific agriculture.'

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Materials and Methods

A study of the desert *Ipomoea* species began in 1982 on the tuber-bearing woody shrub, *I. costata* F. Muell. most commonly found in the central desert of Australia. Its distribution has been determined to be in a relatively narrow band of the continent beginning close to the border between the Northern Territory and Queensland at latitudes 19° and 23°S, and stretching westwards to the Tanami Desert. From there it extends to the Great Sandy Desert where the band of distribution moves northward, narrowing to accommodate the southerly foothill areas of the Kimberley Range of Western Australia, thence to the coast of Dampier Land. From there the distribution is coastal reaching a southerly latitude of c. 24°S. This species, described by Benthham (1869), was sampled for this study as seed of individual plants from localities throughout its wide distribution in the Northern Territory and Western Australia.

Early in the fieldwork, Peter Latz pointed out another *Ipomoea* species in the Northern Territory, a tuber-bearing large herb used by the Aborigines of the region around Tea Tree and Barrow Creek Stations near the Stuart Highway at latitude of c. 22°S. The field description of this species was recorded by Soos and Latz (1987) while taxonomically it was described and named *I. polpha* by Johnson (1986) when naming three other 'new' species including another herbaceous tuber-bearer, *I. argillicola*. The latter species was recorded as being found largely in Queensland, but no information on Aboriginal exploitation was given. The type specimen for *I. polpha* is from the Cook Pastoral District in Queensland and Johnson (1986, p. 220) cautioned that because of their diversity, further study of the central desert specimens 'may warrant the erection of a taxon of subspecific rank' for them.

Seeds from the desert *I. polpha* were collected in the field, and seeds of one of the Queensland populations of that species and of *I. argillicola* were provided by Dr Robert Johnson. Another recently described species (George 1967), the woody shrub *I. yardiensis*, was collected in Karratha, Western Australia where it was growing as a horticultural novelty in institutional gardens. Its natural distribution is limited to the Exmouth Peninsula, Western Australia. The function of the small tuberous growths of this near-endangered species in Aboriginal life is unknown.

Our earliest chromosome counts on mitotic cells from root tips of germinating seeds of *I. costata* and *I. polpha* yielded a 2n number of 30, the basic diploid number for the genus. With the number of endemic species present in Australia, it was decided, in consultation with Dr Johnson, that we should enlarge the cytological aspect of our *Ipomoea* study to include examination of available seed of other species that are included in Johnson's forthcoming revision of the genus in Australia. **Table 1**, listing the material used in this study, is divided into three parts on criteria of endemism as defined by Johnson (pers. comm.): **part a** includes comparatively recent introductions, probably as ornamental plants; **part b**, tropical taxa whose distribution extends to Australia, and are regarded as native but not endemic; and **part c**, the endemic species.

Root tips for chromosome counting were obtained from potted plants grown from seed in a glasshouse at Australian National University, or directly from seeds germinated after puncturing to allow water permeation of the often hard testa. Excised tips were soaked in a 0.2% solution of colchicine for 3 hours, then fixed with Carnoy's fluid (3:1 absolute ethyl alcohol: glacial acetic acid) in which they could be stored at 4°C. For

Table 1a. Somatic chromosome numbers of *Ipomoea* species introduced into Australia

| Species | Queensland Herbarium Voucher No. | Collection area | Chromosome Number 2n |
|---------------------------|--|-----------------|-------------------------|
| <i>I. alba</i> L. | AQ345299 | Brisbane, Qld | 30 |
| <i>I. hederacea</i> Jacq. | AQ450061 | Brisbane, Qld | 30 |
| <i>I. quamoclit</i> L. | AQ378850 | Brisbane, Qld | 30 |
| <i>I. triloba</i> L. | AQ370556 | Cape York, Qld | 30 |

Table 1b. Somatic chromosome numbers of *Ipomoea* species native to but not endemic in Australia

| Species | Queensland Herbarium Voucher No. | Collection area | Chromosome Number 2n |
|---|--|-------------------|-------------------------|
| <i>I. aculeata</i> Blume | AQ292438 | Yeppoon, Qld | 30 |
| <i>I. coptica</i> Roth ex Roemer & Schultes | AQ377824 | Georgetown, Qld | 30 |
| <i>I. diversifolia</i> R. Br. | AQ370534 | Cape York, Qld | 30 |
| <i>I. mauritania</i> B. Jacq. (<i>I. digitata</i>) | AQ343343 | Cape York, Qld | 30 |
| <i>I. eriocarpa</i> R. Br. | AQ264666 | Dingo Beach, Qld | 30 |
| <i>I. pes-caprae</i> subsp. <i>brasiliensis</i> (L.) van Oostr. | AQ442970 | Ellis Beach, Qld | 30 |
| <i>I. plebeia</i> R. Br. | AQ370589 | Mt. Mulgrave, Qld | 60 |
| <i>I. polymorpha</i> Roemer & Schultes | AQ411953 | Rockhampton, Qld | 30 |
| <i>I. macrantha</i> Roemer & Schultes (<i>I. violacea</i>) | AQ343338 | Brisbane, Qld | 30 |

Table 1c. Somatic chromosome numbers of *Ipomoea* species endemic in Australia

| Species | Queensland Herbarium Voucher No. | Collection area | Chromosome Number 2n |
|---|--|-----------------|-------------------------|
| <i>I. argillicola</i> R.W. Johnson | AQ78848 | Longreach, Qld | 30 |
| <i>I. brassii</i> C. White | AQ443652 | Doomadgee, Qld | 30 |
| <i>I. costata</i> F. Muell. ex Benth. | (ANU)* | NT, WA | 30 |
| <i>I. diamantinensis</i> J. Black in Eardley | J46** | Monkira, Qld | 30 |
| <i>I. gracilis</i> R. Br. | AQ378908 | Laura, Qld | 30 |
| <i>I. lonchophylla</i> J. Black | J67** | Boggabilla, NSW | 60 |
| <i>I. muelleri</i> Benth. | AQ443655 | James Range, NT | 30 |
| <i>I. polpha</i> R.W. Johnson | (ANU)* | Tea Tree, NT | 30 |
| <i>I. racemigera</i> F. Muell. | AQ378844 | Qld | 60 |
| <i>I. yardiensis</i> A.S. George & Tate | (ANU)* | Karratha, WA | 30 |

* (ANU) = seed collected from individual plants. Number of plants represented in chromosome counts: *I. costata*, 16; *I. polpha*, 4; *I. yardiensis*, 2. Seed collection deposited in Department of Prehistory, RSPaCS, Australian National University.

** Seed collection numbers, Queensland Herbarium.

counting, chromosome spreads were prepared by the Fuelgen squash technique. Root tips were removed from the fixative, hydrolysed at 60°C for 4–5 minutes in 0.1M hydrochloric acid, then stained with Fuelgen solution for up to 60 minutes. The tips were then macerated individually on slides in 45% acetic acid and counterstained with lacto-propionic orcein for about 5 minutes under coverslips. After warming briefly, preparation were tapped with a glass rod to finally spread material, then squashed for microscopic inspection and counting of chromosomes. Photographs were taken of appropriate chromosome spreads at $\times 1000$ magnification.

It should be mentioned that attempts were made to fix flower-bud material in the field for counts of meiotic chromosomes. Collection at different times of the day, concentrating on the pre-dawn period as Ting and Kehr (1953) have reported as effective for obtaining dividing pollen mother cells in *I. batatas*, was unsuccessful. We can only attribute this to the less than ideal conditions of storage and transport of material collected in our field work.

Results

In Australia, all four introduced species of pantropic distribution are shown to be diploids with $2n = 30$ (**Table 1a**). According to van Ooststroom (1954), *I. alba* and *I. triloba* are of tropical American origin, while *I. quamoclit* 'runs wild' in Malaysia. Bentham (1869) states that the latter species 'is believed to be of East Indian origin' but is now, following O'Donell (1959), also considered to be American. The widespread North American *I. hederacea* considered by some to be conspecific with the Malaysian *I. nil* is subject to taxonomic dispute (van Ooststroom 1954, p. 465). Bearing this confusion in mind, our somatic chromosome count of $2n = 30$ for *I. hederacea* conforms with the result of Jones (1964, p. 217) for '*I. nil* (syn *I. hederacea* Jacq.)', and his review of previous chromosome counts in the species. Although Austin (1986) leans towards synonymy with regard to these two 'species' he nevertheless, on mainly historical grounds, maintains nomenclatural separation. Johnson (pers. comm.) accepts them as two separate entities, noting that *I. nil*, as a very widespread taxon in Australia (but not included in this study), should not be confused with the sample of *I. hederacea* cytologically examined by us. The diploid counts we obtained for *I. triloba* and *I. alba* conform with those made by Jones (1968) as does the determination of *I. hederacea* with the $n = 15$ number by S.P. Vij, S. Singh and V.P. Sachdeva (Love 1974).

Table 1b lists the chromosome numbers of nine species native, but not regarded as endemic to Australia. While most are diploid ($2n = 30$), *I. plebeia* is the lone tetraploid in the group with $2n = 60$. Most of these species are found in tropical island Southeast Asia or Malaysia according to van Ooststroom (1954), with *I. diversifolia* extending to India, *I. coptica*, *I. eriocarpa* and *I. polymorpha* to Africa, with *I. macrantha* and *I. mauritania* being pantropic. While *I. pes-caprae* is pantropic in its distribution, 'the common subspecies throughout Malaysia' is subsp. *brasiliensis* (van Ooststroom 1954, p. 476). The chromosome count for this form in Australia conforms with those reported by Jones (1964) for the species and earlier cytological work on unspecified American subspecies. If the synonymies indicated in **Table 1b** are proved to be firm, there is agreement with Jones (*op. cit.*) in the diploid chromosome number determinations for *I. mauritania* (= *I. digitata*) and *I. macrantha* (= *I. violacea*). As far as can be ascertained, these are the first recordings of chromosome numbers for *I. aculeata* and the tetraploid *I. plebeia*.

The majority of the ten species endemic in Australia are diploids with somatic chromosome number $2n = 30$, although two, *I. lonchophylla* and *I. racemigera*, prove to be tetraploids (**Table 1c**). Mitotic metaphase cells of four of the species are shown in **Figure 1**. It can be seen that the three tuber-bearing species, *I. argillicola*, *I. costata* and *I. polpha*, have somatic complements of 30 chromosomes, as have *I. muelleri* and the Western Australian *I. yardiensis*. Counts from seedling root tips of Western Australian representative plants of *I. costata* were consistent with counts from central Australian plants. It was unfortunate that the same comparison could not be made between the central Australian *I. polpha* plants and representatives of the Queensland populations of the same species; the seed sample from the Queensland Herbarium failed to germinate.

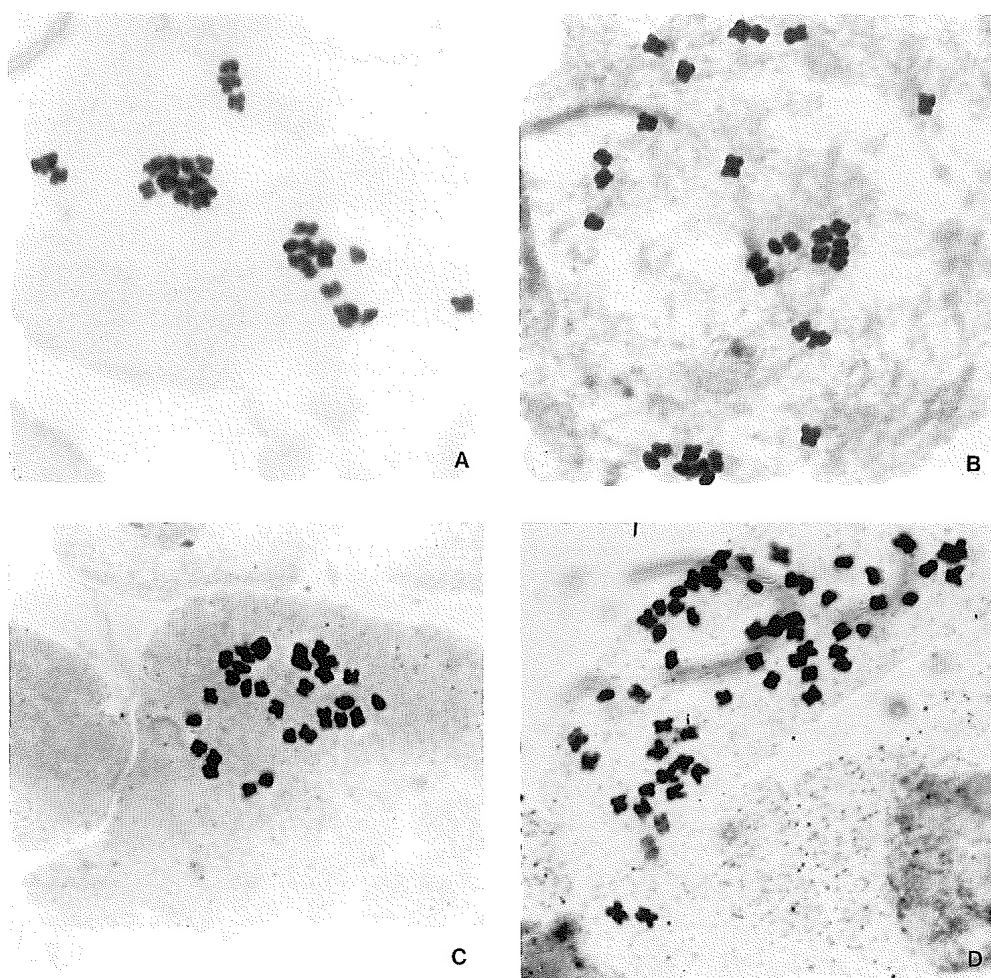


Fig. 1. The chromosomes at mitotic metaphase in root tip cells of four Australian endemic species of *Ipomoea*: $2n = 30$ in A, *I. costata*, B, *I. polpha* and C, *I. yardiensis*; $2n = 60$ in D, *I. lonchophylla*. (Preparations and microphotographs by P.M. Gaffey).

Discussion

The basis chromosome number of $x = 15$ for the genus *Ipomoea* is confirmed for the Australian species, whether native or naturalised. The variation in somatic chromosome number in the endemic species suggest that polyploidy played a role in the evolution of species in Australia. However, Johnson (pers. comm.) points out that the two endemic Australian tetraploid species, *I. lonchophylla* and *I. racemigera* have taxonomic affinity with *I. plebeia* (the only other polyploid found in the Australian collection) and all three species belong to the section *Calycanthemum* of the genus (van Ooststroom 1954). Thus Johnson (pers. comm.) opines that polyploidy in the two Australian species was likely derived from *I. plebeia*, of wide distribution in insular southeast Asia.

The American polyploids occur within two of the seven sections (as recognised by van Ooststroom 1954) of *Ipomoea* other than *Calycanthemum*: the tetraploid *I. ramoni* and *I. tiliacea*, of the section *Batatas*; the tetraploid *I. arborescens* of the section *Leiocalyx*. From available evidence, only in America did any species attain hexaploidy – in the cultivated sweet potato *I. batatas* of the section *Batatas* and allied weed species (Jones 1967; Yen 1974).

Jones (1964, 1968) indicates diploid forms have been found in *I. ramoni*, *I. tiliacea* and *I. arborescens*. Such might be the case in the Australian species assigned as tetraploids in this study if cytological analysis is extended to further plant collection. Of particular interest would be the chromosome counts of *I. plebeia*, with its distribution in Queensland and the southern Indonesian islands, for the area may be determined in which polyploidy occurred independently in the genus beyond the New World.

Acknowledgements

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NOTES

Lectotypification of *Lepinia solomonensis* Hemsley (Apocynaceae) with notes on distribution

Lepinia solomonensis is a small to medium sized tree that was described from material collected in Solomon Islands. The most recent conspectus of *Lepinia* is that of Hosokawa (1934) who recognised three species. Since that time, considerable herbarium holdings of this plant have accumulated and it is now possible to show that its distribution is not restricted to Solomon Islands.

Lepinia solomonensis Hemsley in Hooker's Icon. Pl. 28: t. 2703 (1901). **Type:** Solomon Islands. San Cristobal, *R.B. Comins* 132 (lecto (here designated): K (photo at BRI!); isolecto: BRI!); without locality, *W. Micholitz* (lectopara: K (photo at BRI!)); chiefly New Georgia, 1894–5, *Officers of H.M.S. Penguin* (syn. ?K n.v.).

Hosokawa, Bot. Mag. (Tokyo) 48: 528–530 (1934).

[*Lepinia taitensis* auct. non Decne.: Hemsley, Ann. Bot. 5: 502 (1891); Walker, Forests Brit. Solom. Isl. Protect. 97 (1948)]

Selected Specimens. Papua New Guinea. BOUGAINVILLE PROVINCE: Siwai, 5°34'S, 141°03'E, Jul 1930, *Waterhouse* 159-B (BRI ex K). MILNE BAY PROVINCE: Woodlark Island, Sep 1979, *Kairo* 124 (CBG ex UPNG). Solomon Islands. New Georgia Group, Rendova Island, near Ovusa, Oct 1945, *White* BSIP172 (BRI); Guadalcanal, eastern slopes of Mt Gallego, Jul 1965, *Hunt* 2143 (BRI, BSIP ex K); Oula River area, South Vella Lavella, Aug 1968, *Kotali et al.* BSIP9534 (BSIP); Shoulder Hill area, North Kolombangara, Jan 1968, *Gafui et al.* BSIP8743 (BSIP); Kape Harbour, Kolombangara, Nov 1962, *Whitmore & Womersley* BSIP823 (BSIP); SE Kolombangara, W of Uila River, Dec 1967, *Dennis et al.* BSIP8520 (BSIP); Mango River, SE New Georgia, Mar 1966, *Burn-Murdoch et al.* BSIP7112 (BSIP); SE Choiseul, near Ruruvai, Feb 1964, *Whitmore* BSIP3961 (BSIP); NE Malaita, Nov 1968, *Fa'arodo et al.* BSIP13496 (BSIP); Gizo Island, Jul 1968, *Mauriasi et al.* BSIP11693 (BSIP); West Rennell Island, Magauta area, May 1968, *Sirute'e et al.* BSIP9686 (BSIP); N of Tarapaina, Small Malaita, Jul 1969, *Gafui et al.* BSIP16957 (BSIP); Crossroad from Suholo/Hada, Ulawa Island, Feb 1965, *Teona* BSIP6320 (BSIP); Slopes of Mt Gallego [Guadalcanal], Aug 1972, *Tedder* s.n. (BSIP); Tahanuku area, West Rennell, May 1969, *Gafui et al.* BSIP14696 (BSIP).

Distribution and habitat: Rarely collected in Bougainville and Milne Bay provinces, Papua New Guinea, but widespread and commonly collected in Solomon Islands (Map 1). Plants grow in lowland rainforest.

Notes: This species has been previously known only from the Solomon Islands and Bougainville (Hosokawa 1934), with the Kairo collection being the first from an area politically part of Papua New Guinea. Of the three original syntypes, one is poor and without precise locality (*Micholitz*) and one (*Officers of H.M.S. Penguin*) could not be located at K; therefore the Comins collection is selected as lectotype of Hemsley's name.

Local Names: Several names have been recorded for this plant in Solomon Islands (Table 1) (data from herbarium labels); however, no uses have been given.

Table 1. Local names for *L. solomonensis* in Solomon Islands

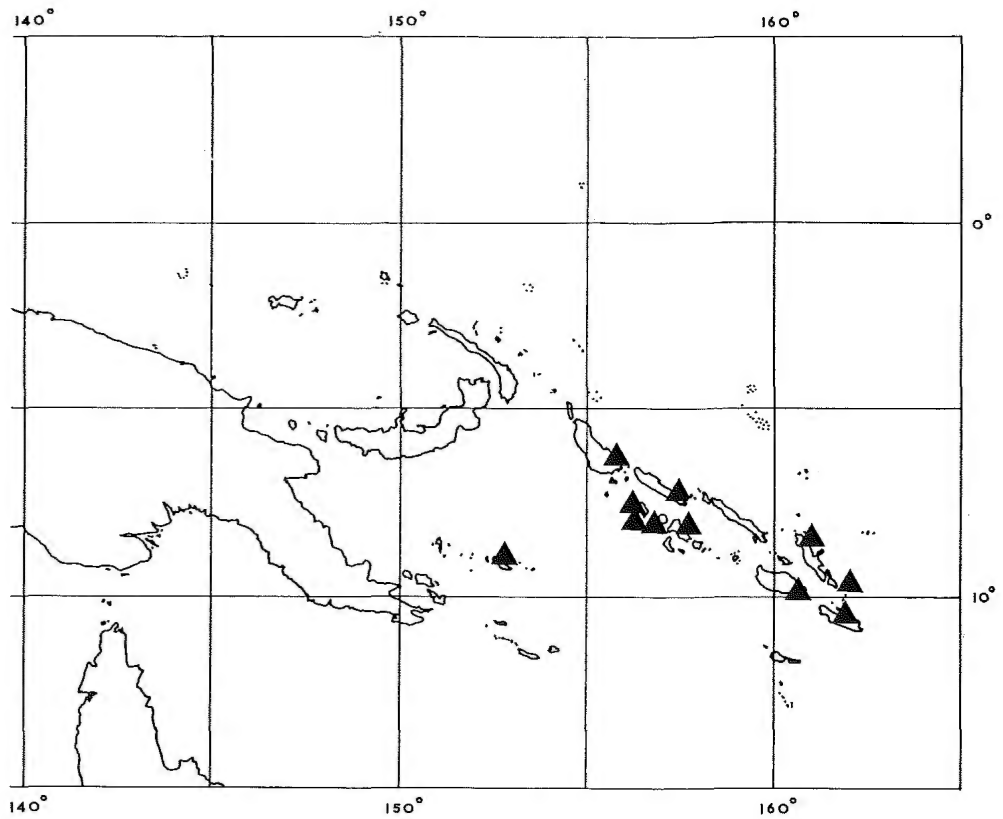
| Name | Dialect | Voucher |
|-------------|-----------|--------------------|
| Daukwailima | Kwara'ae | BSIP9534 |
| Mali Mali | not given | BSIP823 |
| Vutua | Vaturanga | <i>Tedder</i> s.n. |

Acknowledgements

Thanks are due to Greg Leach (DNA), Australian Botanical Liaison Officer at Kew, for searching for and photographing the types mentioned; and the Directors/Curators of the cited herbaria for permission to examine collections at their institutions.

Reference

HOSOKAWA, T. (1934). Conspectus of the genus *Lepinia*. *Botanical Magazine (Tokyo)* 48: 528–530.



Map 1. Distribution in Papuaia of *Lepinia solomonensis*.

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NOTES

***Parsonsia alboflavescens* (Dennst.) Mabb., (Apocynaceae), a new record from Northern Territory, Australia**

An intensive survey of rain forest communities in Northern Territory, Australia was undertaken by the Conservation Commission of the N.T. during the late 1980s resulting in a rich assemblage of material in DNA and several other Australian herbaria. Many new records have resulted from this survey activity, including a single collection of an indeterminable *Parsonsia* species that is not conspecific with other taxa of *Parsonsia* till now recognised for Australia. Subsequent to examining this collection in late 1989, at which stage its identity was unresolved, I visited the Solomon Islands where material of this same species was collected. Curation of Papuan Apocynaceae holdings at BRI, BSIP and CANB revealed this material to be *Parsonsia alboflavescens* (Dennst.) Mabb., previously not recorded for Australia but known to be widespread and common in Asia, Malesia (including New Guinea) and the Solomon Islands (Markgraf 1927; Merrill 1933; Merrill & Perry 1943; Huber 1983; Rani & Matthew 1983).

***Parsonsia alboflavescens* (Dennst.) Mabb., Taxon 26: 532 (1977); *Periploca alboflavescens* Dennst., Schlüssel: 12, 23, 35 (1818) & in Forts. Allg. Deutsch. Garten.-Mag. 3: 31, 41, 83 (1818). Type:** Rheede, Hort. mal. 9: t. 9 (1689).

Rani & Matthew, Fl. Tamilnadu Carnatic 2: 914–915 (1983).

Echites laevigata Moon, Cat. 20 (1824); *Parsonsia laevigata* (Moon) Alston, Ann. Roy. Bot. Gard. Peradeniya 11: 203 (1929). Type: Rheede, Hort. mal. 9, t. 9 (1689).

Alston in Trimen, Handb. Fl. Ceylon 6: 192 (1931); Huber, Rev. Handb. Fl. Ceylon 4: 58 (1983).

Parsonsia helicandra Hook. & Arn., Bot. Beechey's Voy. 197 (1836). Type: China. Kwangtung Province, in the vicinity of Macao, Beechey (holo: ? E, n.v. (permanent loan ex GL, fide Merrill 1933)).

Merr., Brittonia 1: 236 (1933); Merr. & Perry, J. Arnold Arb. 24: 216 (1943).

Parsonsia spiralis Wallich [List no. 1631 (1829), nom. nud.] ex G. Don, Gen. hist. 4: 80 (1837); *Heligme spiralis* (Wallich ex G. Don) Thwaites, Enum. pl. zeyl. 193 (1860). Type: H.B. Calc. & Sillet, [Wallich no. 1631] (holo: K-W (fiche at BRI!); iso: G-DC (fiche at BRI!)).

A.D.C. in DC., Prodr. 8: 402 (1844); J.D. Hook., Fl. Brit. India 3: 650 (1882); Schumann, Bot. Jahrb. Syst. 9: 215 (1887); Fl. Kais. Wilh. Land 114 (1889); Trimen, Handb. Fl. Ceylon 3: 134 (1895); Boerl., Handl. Fl. Ned. Ind. II, 2: 39 (1899); Schumann & Lauterb., Fl. Deutsch Schutzgeb. Südsee 508 (1901); Markgraf, Bot. Jahrb. Syst. 61: 217 (1927).

Chaetosus volubilis Benth. in Hook., London J. Bot. 2: 226 (1843). Type: New Guinea, in 1841, Hinds (holo: K (photo at BRI!)).

Benth. in Hinds, Bot. Voy. H.M.S. Sulphur 179, t. 57 (1844).

Parsonsia cumingiana A.D.C. in DC., Prodr. 8: 402 (1844). Type: Philippines. Luzon, H. Cuming 1490 (holo: ? G, n.v.).

Merr., Brittonia 1: 236 (1933).

Lyonsia viridiflora Bailey, Queensl. Agric. J. 3: 156 (1898). Type: Papua New Guinea, Chads Bay, F.M. Bailey [AQ332837] (holo: BRI!).

Illustration: Matthew, Ill. Fl. Tamilnadu Carnatic, t. 433 (1982).

Selected Specimens. Sumatera. Pulau Tioman/Pahang, Kampong Tekek, Apr 1962, *Kadim & Noor* 667 (BRI ex SING); Pangkor Island, Teluk Ketapang, Dindings, Jul 1955, *Burkill* 221 & *Shah* (BRI ex SING). Philippines. LUZON: Burgos, Ilocos Norte Province, Jul 1918, *Ramos Bur. Sci.* 32949 (BRI); Cagayan Province, Mar 1909, *Ramos Bur. Sci.* 7398 (BRI); Mt Makiling, Laguna Province, May 1945, *Sulit* PNH8446 (BRI ex PNH). Irian Jaya. Island of Jobie [Japan], Aug 1840, *Barclay* 3592 (BM). Papua New Guinea. NEW BRITAIN PROVINCE: Beach front, halfway between Wogonokai Village & Mt Wangore, 5°10'S, 150°02'E, Oct 1974, *Barker & Vinas* LAE66753 (BRI); Melenglo Island, 5°20'S, 149°55'E, Oct 1965, *Gillison* NGF22414 (BRI); Schirlitz Peninsula, south facing beach, Fullerborn Harbour, 6°10'S, 150°45'E, May 1973, *Croft & Katik* NGF15535 (BRI); Fullerborn Harbour, 6°06'S, 150°40'E, Feb 1965, *Sayers* NGF21708 (BRI). BOUGAINVILLE PROVINCE: Karngu, Buin, Oct 1930, *Kajewski* 2230 (BRI ex A). MOROBE PROVINCE: Morobe, Jan 1948, *Womersley* NGF2986 (BRI). MADANG PROVINCE: coastal road, c. 25 miles [41 km] N of Madang, Mar 1968, *Coode & Katik* NGF32747 (BRI). MILNE BAY

PROVINCE: Miadeba, Normanby Island, 9°50'S, 150°50'E, Oct 1971, *Streimann & Lelean* LAE52600 (BRI,CANB); Waikaiuna Bay, Normanby Island, 10°00'S, 150°55'E, Apr 1956, *Womersley* NGF8620 (BRI). **Solomon Islands.** ISABEL PROVINCE: Meringe, Ysabel, Nov 1932, *Brass* 3161 (BRI ex A). GUADALCANAL PROVINCE: near Matepona River, Jul 1945, *White* BSIP52 (BRI); 69 km from Honiara on Aola road, near Vurai, 9°28'S, 160°57'E, Jun 1991, *Forster* 8600 & *Liddle* (BRI,K). MAKIRE PROVINCE: Kira Kira, San Cristobal, Aug 1932, *Brass* 2771 (BRI ex A). CENTRAL PROVINCE: West of Kangua village, Rennell, May 1969, *Gafui et al.* BSIP14675 (BSIP). **Australia.** Northern Territory, 4 km N of Caledon Bay, NE Arnhem Land, 12°44'S, 136°28'E, Mar 1988, *Russell-Smith & Lucas* 5030 (BRI,CANB,DNA,QRS; MEL,NSW *n.v.*).

Notes: A more extensive synonymy for this species is given by Merrill (1933) under *P. helicandra*. As I have not seen the types of some of the names he cites, they are not listed here.

The type of *P. helicandra* was located at GL by Merrill (1933); however, the Beechey collections are now on permanent loan to E (P.S. Short, pers. comm. 1991).

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Dr Jeremy Russell-Smith drew my attention to the N.T. collection of this species in 1989. Mr David Liddle assisted with fieldwork in the Solomon Islands. Dr Philip S. Short located and photographed a number of specimens in overseas herbaria, while Australian Botanical Liaison Officer at Kew (U.K.). The Directors/Curators of BSIP, CANB, DNA and QRS allowed access to collections. The author was funded by the Australian Biological Resources Study for research on Apocynaceae in 1991-92. This assistance is gratefully acknowledged.

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NOTES

Notes on the Naturalised Flora of Queensland, 2

Data are presented on the distributions in Queensland of seven naturalised taxa of succulents from the Asphodelaceae, Crassulaceae, Euphorbiaceae and Dracaenaceae. Two of these families have now been treated in the 'Flora of Australia' and it is the aim of this series of occasional notes to update and revise published information on these naturalised plants. As with the previous note (Forster 1988), the present ones deal with a number of succulent plants, all of which present difficulties in specimen preparation which is undoubtedly the reason why most are either poorly or not represented in collections. Several of these species have not previously been listed as naturalised in such regional floras or checklists as Stanley and Ross (1983, 1989) or Batianoff and Dillewaard (1988) and some represent new distributional records in Queensland. Applying the terminology of Kloot (1987), *Aloe cameronii* Hemsley and *Bryophyllum beauverdii* (Raym.-Hamet) Berger are 'established' and the remaining species are 'adventure' plants.

Monocotyledon family classification follows Dahlgren *et al.* (1984), as opposed to the broadly defined system of Cronquist (1981) that is used in 'Flora of Australia'.

Asphodelaceae

1. *Aloe cameronii* Hemsley, Bot. Mag. 124 t. 7914 (1903).

Specimen examined: Queensland. MORETON DISTRICT: Barclay Street, Bundamba, Ipswich, May 1991, Bird [AQ506891] (BRI,CBG,K,MEL,PRE).

Notes: This species was not previously recorded as naturalised (Forster & Clifford 1986; Forster 1989), and has become established in an area between Brisbane and Ipswich where garden rubbish is dumped. Unlike most naturalised species of *Aloe*, the plants in this population produce copious seed. A description of the species and relevant bibliographic information may be found in Reynolds (1966). A revised key to naturalised species of *Aloe* in Australia is given here to update that given in 'Flora of Australia' (Forster & Clifford 1986) and Forster (1989).

- | | |
|--|--------------------------|
| 1. Plants arborescent | 2 |
| Plants acaulescent | 3 |
| 2. Leaves spotted; inflorescence branched | <i>A. cameronii</i> |
| Leaves unspotted; inflorescence unbranched | <i>A. arborescens</i> |
| 3. Perianth less than 30 mm long; pedicels less than 7 mm long; leaves erect to slightly spreading | <i>A. vera</i> |
| Perianth more than 30 mm long; pedicels more than 7 mm long; leaves spreading to recurved | 4 |
| 4. Racemes condensed, usually slightly wider than long; flowers crowded | <i>A. saponaria</i> |
| Racemes long-cylindrical; flowers not crowded | <i>A. parvibracteata</i> |

Crassulaceae

2. *Bryophyllum beauverdii* (Raym.-Hamet) Berger in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 412 (1930); *Kalanchoe beauverdii* Raym.-Hamet, Bull. Herb. Boiss., Ser. 2, 7: 87 (1907).

Specimen examined: Queensland. MORETON DISTRICT: Pine Mt, 10 km NW of Ipswich, Aug 1991, Bird [AQ506889] (AD, BRI).

Notes: A new record of naturalisation for Queensland (cf. Stanley & Ross 1983) this species occurs in a disturbed area away from habitation. About 11 species of *Bryophyllum* are commonly cultivated in Australia (Forster 1985) and other hardy species can be expected to become naturalised in the future.

3. *Bryophyllum fedtschenkoi* (Raym.-Hamet & H. Perrier) Lauz.-March., Compt. R. Hedb. Seances Acad. Sci., Ser. D (Paris) 278 (20): 2508 (1974); *Kalanchoe fedtschenkoi* Raym.-Hamet & H. Perrier, Ann. Mus. Col. Marseille, Ser. 3, 7: 75 (1915).

Specimens examined: Queensland. MORETON DISTRICT: Westlake, a western Brisbane suburb, Jul 1980, *Stanley* [AQ343754] (BRI); Western boundary of Laidley golf course, Laidley Shire, Aug 1985, *McKenzie* [AQ398800] (BRI); New Chum, 1 km S of Dinmore, Ipswich, Aug 1991, *Bird* [AQ506888] (AD, BRI).

Notes: A new record of naturalisation for Queensland (cf. Stanley & Ross 1983) this species is established in areas where garden rubbish is dumped.

Key to naturalised species of *Bryophyllum* in Queensland

1. Plants twining; foliage grey-black **B. beauverdii**
Plants erect, not twining; foliage pink or green 2
2. Leaves pinnate 3
Leaves simple 4
3. Leaflets 3–5, early leaves often 1-foliate **B. pinnatum**
Leaflets 7 or more **B. proliferum**
4. Leaf lamina subcylindrical **B. delagoense***
Leaf lamina flattened 5
5. Leaf lamina > 10 cm long and 2.5 cm wide **B. daigremontianum**
Leaf lamina < 10 cm long and 2.5 cm wide 6
6. Stems and leaves mottled grey and green; lamina < 2 cm wide **B. daigremontianum** × **B. delagoense***
Stems and leaves without mottling, pink-green; lamina > 2 cm wide **B. fedtschenkoi**

Euphorbiaceae

4. *Euphorbia tirucalli* L., Sp. Pl. 452 (1753).

Specimen examined: Queensland. BURNETT DISTRICT: road between Hivesville and Proston, Wondai Shire, Feb 1981, *Waldron* [AQ345523] (BRI).

Notes: This is a commonly cultivated self-fertile plant and spreads both by seed and vegetatively by stem portions. A descriptive account may be found in Carter (1988). Although commonly cultivated in south-east Queensland, this record appears to the first instance where the plant has persisted away from human habitation.

5. *Pedilanthus tithymaloides* subsp. *smallii* (Millsp.) Dressler, Contr. Gray Herb. 182: 152 (1957).

Specimens examined: Queensland. COOK DISTRICT: Booby Island, Great Barrier Reef, c. 34 km from Thursday Island, Jul 1969, *Heatwole* [AQ207093] (BRI); Lamond Hill, Apr 1988, *Forster* 4207 & *Liddle* (BRI); Low Isle, Aug 1973, *Stoddart* 4302 (BRI); Green Island, Aug 1973, *Stoddart* 4270 (BRI). SOUTH KENNEDY DISTRICT: Mt Christian, Jan 1975, *Morton* T4105 (BRI). PORT CURTIS DISTRICT: 2 km SE of Butlerville, northern end of Mt Larcom Range, Jan 1988, *Forster* 3385 & *Gibson* (BRI).

Notes: This species is naturalised in a number of localities in coastal Queensland, usually in areas of previous habitation. It has not been previously considered as naturalised (cf. Batianoff & Dillewaard 1988); however, the populations examined are persisting and spreading without human assistance. A descriptive account of it may be found in Carter (1988). *P. tithymaloides* is commonly cultivated and appears tolerant of high levels of salt in the soil at seaside localities.

*The name *B. delagoense* (Ecklon & Zeyher) Schinz is used instead of *B. tubiflorum* Harvey following Toelken & Leistner (1986).

6. *Synadenium grantii* J.D. Hook., Bot. Mag. 93: 5633 (1867).

Specimen examined: Queensland. MORETON DISTRICT: Bergins Hill, Bundamba, Ipswich, May 1991, Bird [AQ506890] (BRI,CBG,MEL).

Notes: This plant is commonly cultivated in gardens in Queensland. It has become established and is persisting at several localities in south-east Queensland where garden rubbish has been dumped. It has not previously been considered as naturalised in Queensland and is not mentioned by Stanley and Ross (1983). A description of it and associated bibliographic information may be found in Carter (1988).

Dracaenaceae**7. *Sansevieria trifasciata* Prain**

Additional specimens examined: Queensland. COOK DISTRICT: Lamond Hill, Apr 1988, Forster 4205 & Liddle (BRI); Green Island, Sep 1981, Fosberg 61503 (BRI). MORETON DISTRICT: Next to Merri Merri Housing Estate, 1.7 km SW Mt Coot-tha Lookout, Brisbane, Jul 1986, Forster 2527 & Bird (BRI).

Notes: The history of this species' introduction to Australia and use as a fibre plant are outlined by Forster (1987). The above records are in addition to those given in Forster (1986) and extend its known range of naturalisation in Queensland considerably.

Acknowledgement

Many of these new records result from the continuing and enthusiastic documentation of the Ipswich area flora by Lloyd Bird of Bundamba.

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BOOK REVIEW

G.E. Gibbs-Russell, L. Watson, M. Koekemoer, N.P. Barker, H.M. Anderson, M.J. Dallwitz. *Grasses of Southern Africa*. Memoirs of the Botanical Society of South Africa, No 58. Pp. ix + 437, 235 text-figures, dot maps, 24 plates (216 photographs). South Africa: National Botanic Gardens/Botanical Research Institute, Pretoria, 1990. Price (overseas) £15.15 (\$24.70). ISBN 0 620 14846 2.

This book is unique in that it has been compiled using computer technology by a team of people (seven authors with an editorial committee of six) in a relatively short time – about 3 years as far as I know. Indeed it is, as stated in an introductory chapter, “the only identification manual for a major plant family occurring in a large area to be produced from computerized data.” The keys and descriptions of genera have been produced from the database of world grass genera of Watson *et al.* (1988) using the KEY and CONFOR programs of DELTA (Dallwitz & Paine 1986), the species descriptions have been produced from a basic character list representing “the minimum information required to distinguish species from others in its genus” using DELTA, the distribution maps, one for each entity (species or infra-specific taxon), have been plotted from specimen records from the PRECIS data-base (Gibbs-Russell & Arnold 1989) and generic keys and species descriptions and generic keys have been printed using the program TYPSET (Dallwitz & Zurcher 1988). The only descriptive part of the text not prepared by DELTA were the species keys as the amount of data presently available is insufficient for key generation. At least one species of each genus is illustrated as well as there being at least one spikelet photograph for each genus.

The book is essentially a update and successor to Chippindall (1955), a work long out of print and a well-known and classical reference work on southern African grasses used world wide. As both accounts have a double-columned text and are comparable in size (Gibbs-Russell *et al.* 403 A4 pages and 235 figures; Chippindall 527 Quarto pages and 421 figures) and cover the same geographical area of South Africa, Namibia and Botswana a comparison can be made between the two. The multi-authorship of Gibbs-Russell *et al.* is reflected in the very different look of the computer generated generic keys and descriptions of Watson compared with the naturally generated species descriptions of the South African based authors. In my view there should have been some judicious pruning of the generic descriptions and keys with a word-processor to make them more user-friendly and cut down the rather lengthy text resulting from computer-generated methods. These points have also been mentioned in another recent review (Clayton 1991). I also think most of the generic synonymy and the generic character list extracted straight from the world generic list, is extraneous in the South African context. Chippindall's work on the other hand had the advantage of single authorship by an agrostologist who had a very good overall grasp of the taxonomic problems of South African grasses reflected by their morphology, so refreshingly discussed in the body of her work. There is, on the other hand, little discussion of this nature in the recent book.

The most useful aspects of Gibbs-Russell *et al.* are the updating of the nomenclature of South African grasses, a distribution map of each entity, illustrations of species not previously illustrated, a useful glossary and introduction, including an informative overview of leaf-blade anatomy, photosynthetic pathways and climatic adaptation, features relatively unknown at the time of Chippindall's account. However the main compilation by computer of this book illustrates well how this technique may well become standard practice in books of this nature in the future.

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Referees consulted for Volume 3

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